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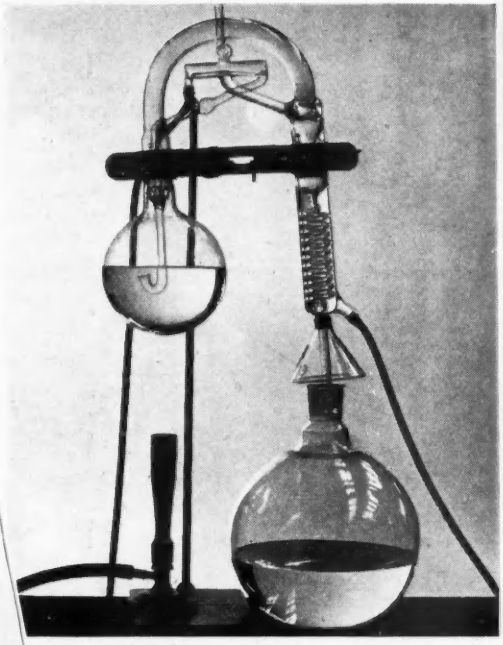

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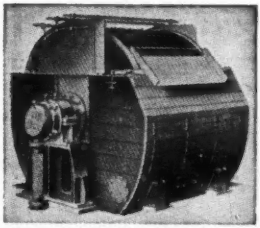

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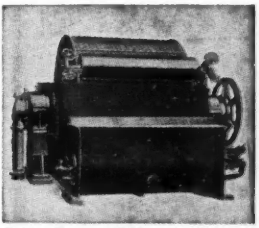

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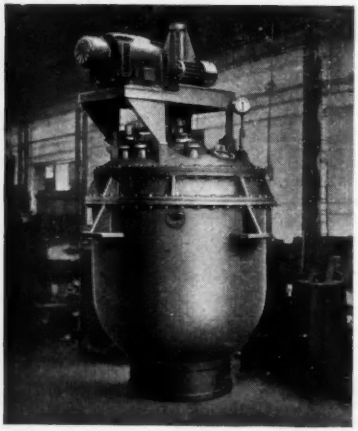

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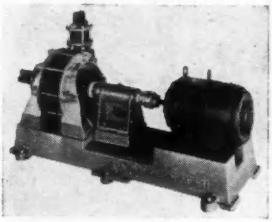

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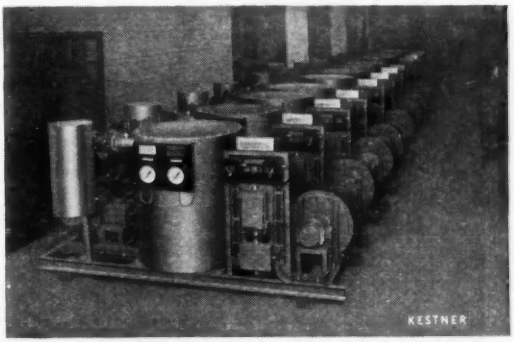

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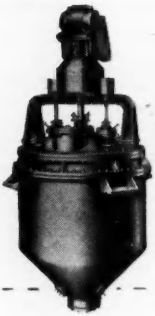

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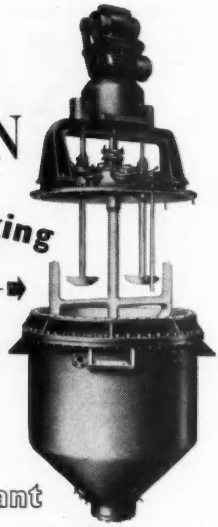

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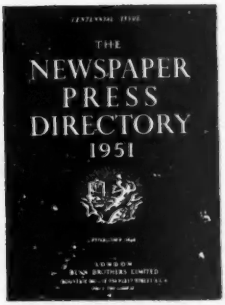

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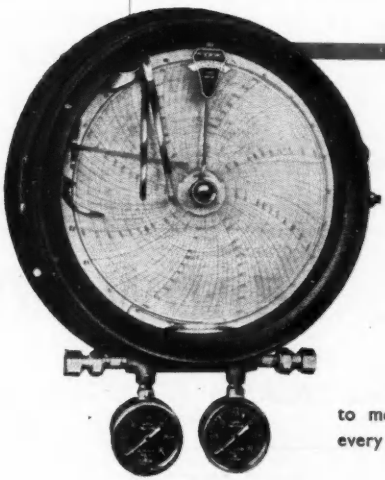

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Volume LXIV 2 June 1951 Number 1664

Toxic Chemicals for Farming

IT is almost a year ago that public opinion was sharply roused by the deaths of two agricultural spraying workers after using DNC weedkiller. At the subsequent inquest the jury recommended that the practice of using this substance in hot weather should be considered 'by the highest authority'. (See CHEMICAL AGE, 1 July, 1950, for report and leading article comments.) Official action followed promptly. The Minister of Agriculture appointed a Working Party to consider the case for the use of toxic agricultural substances and to recommend measures that would enable them to be applied safely. It must be regarded as highly satisfactory that this Working Party has been able to complete its task and issue a Report in printed form in less than a year. ('Toxic Chemicals in Agriculture', HMSO, May 1951, 1s.).

The Working Party limited their inquiries to the dinitro weedkillers and the modern organo-phosphorus insecticides. In this decision they were echoing the doubts of the medical profession, for in the last Report of the Medical Research Council the toxic risks associated with these two classes of agricultural chemicals were sharply stressed. However, no case for the prohibition of these materials was established. A range of important weeds that are resistant to the safer selective weedkillers or to sulphuric acid (now, or course, scarce in any case) can be readily controlled by DNC or DNBP. Similarly, there are major pests, e.g., red spider and some aphids, which can be much more effectively controlled by parathion or TEPP than by any other insecticides. 'We are of opinion that until harmless alternatives can be found, the use of dinitro weedkillers and organophosphorus insecticides must go forward. . . . Our task, therefore, is to recommend measures for the protection of workers who are handling these chemical compounds in agriculture, on the assumption that they will be used on an increasing scale.'

The most important and effective type of protection recommended is clothing. The toxic risks of these chemicals are largely created by cumulative absorption —through the skin, by inhalation and ingestion. Hot weather increases the danger. Poisoning as a result of single exposure is not the main risk; with DNC it is unlikely if not impossible; with the organo-phosphorus group it is possible but not probable. The greater risk lies in chronic toxicity, leading to a gradual build-up of the chemical concerned and a sudden on-set of serious symptoms. It is feared that as this danger-point is approached, the susceptibility of the individual increases. Owing to the

urgency of this matter, the recommendations on protective clothing were made public before the printing of the Report and these were outlined in THE CHEMICAL AGE, 3 March, 1951, p. 337. The Working Party consider that the provision of such clothing should be a statutory requirement where dinitro or organo-phosphorus substances are used and that some inspection and enforcement machinery should be created. There is nothing revolutionary in this principle; it is precisely the same principle that applies in factory law and, where there is risk to life in an operation of work, the field or the farm should rightly be subject to the same protective laws as the workshop.

As in factories, however, there is the thorny problem of the non-co-operative worker who will not make use of the protective clothing available. The Working Party recommends that any person employing workers on the agricultural use of dinitro or organo-phosphorus compounds shall be required to make proper arrangements for supervision and instruction. They also suggest that workers should accept some responsibility for their own safety and that the careless worker should be transferred *permanently* to other work.

As to manufacturers' responsibilities, the Working Party felt that too much cautionary and instructive matter rather than too little had been given on container labels. They recommend the large and clear printing of the words 'DEADLY POISON', with statements of the precautions to be taken, of antidotes where known, and purposes for which the substance is to be used. Such labels should be of a permanent kind and instructions about weed or pest control should be given on separate leaflets. Containers should be designed so that splashing when pouring into the spray tank is prevented. It is recommended that all organo-phosphorus compounds, when formulated, should be given a distinctive colour.

An important recommendation concerns the sale of these two groups of chemicals to the ordinary public. In view of the dangers associated with ignorant or inexperienced use, it is urged that retail sales (other than of DNC in low concentration winter wash formulation) should be restricted to chemists' shops. This is a most timely proposal for it is still possible to buy small and concentrated quantities of organo-phosphorus insecticides from garden sundries' shops and in some cases there is not even a clear statement that the substance is, in fact, poisonous.

Agricultural scientists and the manufacturers of these substances will welcome this Report. It is to be hoped that its translation into law will not be long delayed. Safety measures will not inhibit the useful progress of these substances; on the contrary, further accidents through the lack of proper precautions would increase public apprehension and the use of dinitro weedkillers and organo-phosphorus insecticides would then be totally prohibited.

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The annual subscription to THE CHEMICAL AGE is 35s. Single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Notes & Comments

Artists on their Metal

ALASTING fame is presumably desired by all artists and a step which (regardless of merit!) may help their creations to a greater expectation of life is the use of aluminium sheet for oil painting in the place of the traditional canvas. This development of 'Art-Al Panels', which originated in Canada in 1945, has now spread to Europe according to the April issue of *Aluminium News*, Montreal. Recent experiments in Switzerland have proved that $\frac{1}{8}$ in. sheet of aluminium, coated with a porous skin of oxide, provides a practical and permanent foundation for oil painting. Unlike canvas, this material will not tear, split, cut or wrinkle, requires no cumbersome stretcher and consequently may be stored in less space. A uniformly smooth surface is provided, while it is claimed that pigments painted on aluminium have a greater brilliance, which is retained even after exposure to strong light. Canadian experience has shown that a finished painting on aluminium may be dropped on the floor with relative impunity, and once the pigment film is dried, there is a higher resistance to 'scratch' damage. Tests also showed that extreme temperature changes do not cause the paint to fracture, and the paint itself is less subject to deterioration from atmospheric gases or fumes. While this new media may well prove a source of fresh inspiration and encouragement to the artist, it also raises some problems. Who, after all, would like to be responsible for perpetuating in such almost indestructible form, some examples of modern art? What is the 20th century art thief to do? Where his predecessor could cut the canvas of an Old Master from its frame, roll it up, and stealthily steal away, to-day he would appear to have to combine at least some knowledge of the chemist and the metallurgist before he can help himself to a modern masterpiece. There is also the danger that the less aesthetic burglar might be tempted (perish the thought!) not by the skill of the artist, but by the value and usefulness of the metal.

A New Pulp Process

THE idea of using organic solvents to separate the lignin and cellulose in wood is far from new. From time to time solvent processes have been suggested but the results have never been good enough to threaten traditional methods. The solvents have caused degradation of the cellulose, left residues in the pulp, and in any case have never given a complete removal of lignin. Nevertheless, no one would look upon the sulphite process as ideal or unassailable. It creates a severe waste disposal problem and in the sense that it consumes sulphur it has a new disadvantage in a sulphur-scarce world. Reports that experiments by the University of Washington and a U.S. timber company are successfully producing pulp by a solvent process are more likely to attract attention to-day than would have been the case five years ago.

Triethylene Glycol Used

THE solvent employed is triethylene glycol. It can be used alone but considerably lower process temperatures are possible if a little mineral acid is used as well. Aluminium chloride is used as a catalyst. Better pulp yields are said to be achieved, and the pulp makes a paper rather stronger than kraft. There is much less hydrolysis of the binding hemicellulose than in conventional pulping methods and this enables short-fibred woods, hitherto unsuitable for paper-making, to be used. The conversion of this experimental process into large-scale pulp making seems to depend upon successful solvent recovery. A high rate of recovery and re-use of the triethylene glycol will put the process on a sound economic footing. Recovery is at present approached by draining, pressing, and drying. The dissolved lignin is easily removed by dilution with water and after filtration it can be dried to a powder with useful by-product possibilities.

Pioneers in Teaching

MANCHESTER, as befits the centre of the chemical industry, has long been a pioneer in the teaching of chemistry. It is appropriate that the University, which owes its foundation to the college endowed by John Owens in 1851, should be celebrating its centenary at the time when scientific advancement is being generally commemorated by the Festival of Britain. The first professor of chemistry was Edward Frankland, noted for his researches on the organo-metallic compounds and his theory of valency. His lectures on technical chemistry, including the manufacture of sulphuric and hydrochloric acids, glass and porcelain and demonstrations in dyeing and calico printing, were said to be the first of the kind in this country. Despite Frankland's efforts the number of chemical students declined and he resigned. He was succeeded in 1857 by Henry Roscoe, to whose gifts as a teacher and organiser was largely due the reputation of the college as a place of education and the fact that its chemistry department long held a place second to no other academic institution in the United Kingdom. He demonstrated that science could be made an efficient instrument of education and that such an education was necessary for a successful industrial career. An important change during Roscoe's 29 years of office was the appointment of Carl Schorlemmer to the first chair of organic chemistry, not only in Manchester, but in the country. Many distinguished names followed including W. H. Perkin, son of the discoverer of mauve; Arthur Lapworth (1913-22); Sir Robert Robinson (1923-28); Sir Ian Heilbron (1933-38); A. R. Todd (1938-44); and E. L. Hirst (1944-47). The first professor of physical chemistry was Professor Polanyi, appointed in 1933. The college, which became a university by charter in 1880, built a new academic institution—a civic university, and though primarily designed for its own region or province, its well-being inevitably contributes to the good of the nation also. With such a tradition and such well-known names to look back upon the University of Manchester may well face the future with hope and confidence.

Synthetic Rubber

RUBBER, like oil, is of tremendous importance in peace or war, and at one time it too could have caused just such an international crisis as oil is now creating in Persia. Now the situation has altered somewhat, as rubber, unlike oil, is no longer irreplaceable. Synthetic rubber was first produced, like many other substitutes, as a result of a war cutting off sources of supply. America, with her vast resources, undertook the gigantic task of manufacturing it and by the end of the second World War her potential output was almost equal to the pre-war output of natural rubber. Following the defeat of the Japanese the U.S.A. closed down most of her synthetic rubber plants as it was thought that once the natural product was again available that there would be little demand for the synthesised material. It soon became apparent, however, that so great was the need for rubber in the modern economy, particularly in view of needs for rearmament and stockpiling, that the market could absorb the output from both sources.

Britain Must Follow

NOW America has most of her plants in full operation and other countries are either building new plants or expanding those they already had. Technical developments since the war have led to the production of several synthetic rubbers that possess properties now owned by the natural product. As a result of these developments Britain now finds herself in the position where her rubber goods manufacturers will be at a great disadvantage in overseas competition unless they too have access to the synthetic material. The new product has ceased to be a supplement to natural rubber; for many uses it is now able to replace natural rubber to advantage. In view of this, and in view of the need to be prepared in case of a third world war, it is absolutely essential that this country start exploring the synthetic rubber field on its own account. Other countries outside the U.S.A. have either built, or have plans laid to build, plants for its production and we must not lag too far behind.

S.C.I.'s Oldest Group Has Successful Year

Chemical Engineering Section's Annual Meeting

A SATISFACTORY year of activity and an increase in membership, bringing the total up to 780, was recorded in the report of the general committee for the year 1950, presented by the honorary secretary, Mr. R. C. Odams, of the Chemical Engineering Group of the Society of Chemical Industry, at its annual general meeting held at the Waldorf Hotel, Aldwych, London, on 23 May. Mr. Norman C. Fraser, the retiring chairman, presided.

The usual full programme of meetings in London, and joint meetings in the provinces with local sections of the society had been carried out.

Reference was made in the report to the valuable work of the Papers Sub-Committee under its convener, Dr. Preston. Approved papers presented to the group will in future appear regularly in the publications of the society, as well as in the Proceeding of the group.

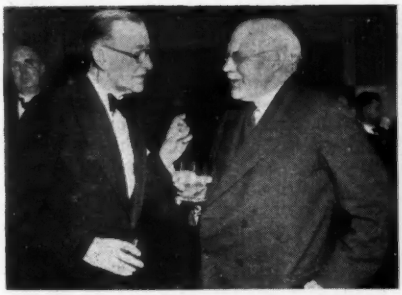
The group was actively associated with the annual general meeting of the society in Newcastle last July, at which it arranged for a paper to be presented by Dr. G. I. Higson on 'The Manufacture of Ammonium Sulphate from Anhydrite.' The chairman of the group had also presided at one of the sessions of the society's conference on 'Materials of Construction' held in Birmingham in May.

Representatives of the Society on various committees of the British Standards Institution and other societies had continued to be nominated by the group. Its responsibility for the preparation of the chemical engineering section of the Society's annual report on 'Applied Chemistry', had been kept up, the work having been undertaken by Dr. G. Edwards, of Glasgow, as in former years. Volumes 29 and 30 of the Proceedings for the years 1947 and 1948 respectively were published during the year.

Formation of the new Corrosion Group of the society was welcomed by the Group. It had also sponsored several of the papers which are to be presented at the annual general meeting of the Society this year. Closest co-operation with the Institution of Chemical Engineers had been maintained.

As in past years, the general committee expressed its appreciation of the work of the conveners of the various sub-committees and of the loyal services given by the hon. editor, Major D. M. Wilson, and by the hon. recorder, Mr. H. W. Thorp, and registered its sincere appreciation of the continued devoted and valued service of the assistant secretary, Mr. C. J. T. Mackie, and his staff.

Sympathy with Mr. Mackie in his recent accident, was expressed by the meeting which wished him a speedy recovery and return to the work in which he was so invaluable.



Major V. F. Gloag (chairman of the BCPMA) talking to Sir Harold Hartley (president of the Institution of Chemical Engineers)

Mr. J. Arthur Reavell shares a joke with Dr. L. H. Lampitt (past president of the Society of Chemical Industry)

The chairman expressed the warm thanks of the group to Mr. E. LeQ. Herbert who had retired after four or five years of efficient service in the office of hon. secretary, while he also formally welcomed his successor Mr. Odams.

Appreciation was also expressed to Dr. J. B. Brennan, general secretary of the Institution of Chemical Engineers, who had very kindly acted for the group on Mr. Mackie's behalf.

The report and the accounts, which latter were presented by the hon. treasurer, Mr. F. A. Greene, were adopted.

To fill vacancies on the general committee due to retirements, Messrs. L. J. Clark, N. C. Fraser, W. C. Gilpin and P. H. Sykes, were declared elected.

It was announced that the following had been elected by the committee as officers for the year 1951-1952:—

Chairman: Mr. H. V. Potter; *hon. secretary*, Mr. R. C. Odams; *hon. treasurer*, Mr. F. A. Greene; *hon. editor*, Major D. M. Wilson; *hon. recorder*, Mr. H. W. Thorp.

Appreciation of the honour of being elected chairman was expressed by Mr. Potter, who on behalf of the group thanked his predecessor, Mr. Norman C. Fraser for his excellent service during the past two years.

Need for More Chemical Engineers Stressed at Dinner

SHORTAGE of chemical engineers to fill the increasing demands for their services was emphasised by Mr. Norman Fraser, chairman of the Chemical Engineering Group, Society of Chemical Industry, at its annual dinner held following the annual general meeting.

People in all parts of the world were attracted to membership of the society of Chemical Industry, said Mr. Fraser, and he was proud to have served for two years as chairman of the oldest group.

Some confusion occasionally seemed to exist as to why the Institution of Chemical Engineers and the Chemical Engineering Group existed side by side as separate bodies. There was, however, plenty of room for both and they worked harmoniously together, for while the institution was a qualifying body, the Group had a much wider scope, welcoming as it did all people with an interest in chemical engineering.

There was, unfortunately, an insufficient supply of chemical engineers to meet the increasing demand brought about by the development of vast new plants at Wilton, Grangemouth, Immingham, and other parts of the country.

Although the Group was doing well, continued the chairman—membership had increased by 80 this year—he felt that it should go all out to draw in fresh people from the great provincial centres. Numbers were not, however, the main concern, what was really wanted was keen and active members who would take part in the work of the Group.

An indication of the widespread activities of the SCI was the inauguration that evening in Liverpool of the Oils and Fats Group, and it was with pleasure that he had sent greetings and good wishes for its future from the oldest Group to its new associate.

Speeches at such pleasant occasions as this annual dinner, should be kept to a minimum, concluded Mr. Fraser, and he was therefore combining the toast of the SCI and the Guests. With the society he was associating the name of its president, Mr. Stanley Robson, whom they were always delighted to have with them.

Among their many distinguished guests he had pleasure in welcoming Mr. H. A. R. Binney, director of the British Standards Institution, which is this year celebrating its Golden Jubilee, and is a body which could do a tremendous amount of good.

The chairman also extended a warm welcome to Sir Harold Hartley (president of the Institution of Chemical Engineers); Mr. C. G. Hayman (chairman, Association of British Chemical Manufacturers); Major V. F. Gloag (chairman, British Chemical Plant Manufacturers' Association); Dr. L. H. Lampitt (past-president and hon. foreign secretary of the Society of Chemical Industry); distinguished representatives of other societies, and a number of officers of the society, some of whom were members of the group.

Responding to the toast of the society, Mr. Stanley Robson referred briefly to its healthy state and the natural growth of fresh groups as demanded by increased

From left to right: Mr. H. V. Potter (the new chairman of the Group), Dr. N. Patel, Mr. N. Fraser (immediate past chairman), Mr. H. A. R. Binney (Director of the British Standards Institution)

interest or new developments in any particular section of the chemical industry.

Although the Chemical Engineering Group was the oldest and chemical engineering was a science which entered pretty well into every chemical activity, the society was proud of its broad outlook and welcomed into its membership not only chemists and engineers but representatives of the legal, business and administrative aspects which made it a fair cross section of the chemical industry. This breadth of view and ability to spread its activities over a very wide and humane field was indeed one of the main features of the society.

When he accepted with pleasure the invitation to attend their dinner, said Mr. H. A. R. Binney, he had been told he could talk about anything he liked with a rider that the subject of standards was not exactly barred. This had led him to thoughts of a community without standards, and he dealt amusingly with some of the complications that would ensue in such a state.

In a more serious vein, Mr. Binney then presented what he termed a 'miscellany of thoughts' on the British industrial and economic scene, in which he emphasised the vital part to be played by the chemists and chemical engineers not only in production techniques but also in the conservation and substitution of materials.

Tracing the gradual development of controls the speaker said that obviously planning had come to stay for a long time—especially in any scheme for defence or if regrettably necessary in preparation for war. Too often the planners were blamed, but they could not be expected to have powers of prophecy and it was more often the manner in which plans were executed that should be the object of criticism.

The social feeling of our time was that there should be no exploitation of labour and the spurs to increase efficiency in America were better pay and better plant.

Higher wages and easier conditions must be accompanied by a realisation of the worker that he, in turn, owes a duty to the State. There had been a growing tendency to concentrate on security to the comparative elimination of efficiency. It was obvious, however, that without efficiency security must be only short lived.

While there was no royal road to greater efficiency the psychological aspect was of considerable importance, and it was to be hoped that any drive towards this end would include providing for the mass of population the best aesthetic designs.

Obviously of vital concern to efficiency was the problem of raw materials. Where there were scarcities, or where the source was likely to become exhausted, a long-term policy was essential. Much forethought was needed, and some of the present difficulties might not have arisen if the matter had been more boldly tackled in its earlier stages with a view to possible development.

In conclusion, Mr. Binney, on behalf of his fellow guests, wished the Group and the Society of Chemical Industry every success not only for their own sake but because the pursuit of their professional aims must ultimately be to the wider interests of the economic well-being of the country.

Underground Gasification

New Experiments in Worcestershire

TRIALS on the underground gasification of coal which are being conducted by the Ministry of Fuel and Power and which have been in progress at Newman Spinney, near Chesterfield, since 1949 are to be continued at that site for another year. Other trials are being initiated at a site in Worcestershire, near Kidderminster.

At Newman Spinney two new systems will be involved. It is hoped to start gasification at about 80 ft. depth on one during June. The other and probably larger system will, if possible, be created later by high pressure in the Furnace seam at nearly 200 ft. depth using the new technique developed in 1950. These trials aim to discover what changes in gas quality or output, and in the spread of the reaction underground, result from changes in air rate, pressure, use of steam and other factors under manual control.

It is also important to find out what effect different coals or geological formations may have on the process. This involves a succession of tests on a variety of sites representing differing conditions, in the selection of which the National Coal Board is actively co-operating. How many sites may require to be tested will depend upon results and may be few or many according to the difficulties encountered and the degree of success achieved. The trials are still at a very early stage.

Exploratory Boreholes

Exploratory boreholes which are being drilled near the old Bayton Colliery about nine miles from Kidderminster indicate a faulted geological formation in which the depth of coal varies from 200 to 600 ft. and on which tests should yield useful information. The intention is to drill some six (6-in.) boreholes in a circle down to the coal, the holes being cased and grouted, and the coal lying between them ignited and gasified with the aid of air blowers and compressors. Scientific observations will then be made day and night on the quality of the gas produced and other relevant factors. This procedure may be repeated several times in the locality on coal at different depths. Each experiment will take several months.

The proposals for the experiments in the Bayton area have been communicated to the County Planning Committee of the Worcestershire County Council, and, on the basis of conditions which have been agreed, that body raises no objection. Co-operation will be maintained with the council during the progress of the tests.

Mixing and Agitation

Conference to be Held in London

PARTICULAR interest attaches to the conference to be held in July on 'Mixing and Agitation in Liquid Media', for although the subject is of importance in many industries, the paucity of the literature is well known to chemical engineers.

The conference, organised by the Institution of Chemical Engineers, will be held at the Royal Institution, Albemarle Street, London, on 17 July, from 10 a.m.-12.30 p.m., and from 2 p.m. to 4.30 p.m.

At the morning session three papers will be presented. The first, by Professor D. M. Newitt, past-president of the Institution of Chemical Engineers, and G. C. Shipp and C. R. Black, of the chemical engineering department, Imperial College of Science and Technology, will take the form of a critical review entitled 'Recent Developments in the Theory and Practice of Agitating and Mixing'.

Various problems on mixing of coals and oils for purposes of combustion, carbonisation, hydrogenation, etc., will be considered in the second paper on 'The Mixing of Coal with Liquids', by R. A. A. Taylor, of the Fuel Research Station.

'Practical Aspects of Liquid Mixing and Agitation', are the subject of the third paper by Brian N. Reavell, of Kestner Evaporator & Engineering Co., Ltd., who will refer to the difficulties in using a purely theoretical approach to the determination of design details, and horsepower for stirring equipment.

The first paper at the afternoon session will be by Professor F. H. Garner and A. H. P. Skelland, of the Chemical Engineering Department, University of Birmingham, on 'Liquid-Liquid Mixing as Affected by Internal Circulation with Droplets', which describes the conditions under which circulation occurs internally in liquid droplets.

Some Industrial Applications of Microanalysis

MICROCHEMICAL techniques have proved invaluable in the examination of a large variety of industrial materials. Because of their speed, they are often used even when large amounts of the sample are available. Such an application, however, is not always desirable as the problems of sampling may have to be taken into account; again, a greater strain may be imposed on the operator. In such cases, semi-micro methods are to be preferred, since in the long run they are less time-consuming.

The main advantage of the use of micro methods is when the amount of sample available for analysis is limited. This situation occurs in many fields of industrial chemistry as is evidenced by the extensive literature on the subject.

In examinations of the dispersion of mixtures of coal and stone dust as used to prevent explosions in coal mines, only very small amounts of sample are available for analysis. It is possible, however, to determine moisture, ash, carbonate and carbon and hydrogen on a single sample, the information obtained usually being sufficient for the purpose required.

In the field of explosives analysis the heterogeneity of a single cartridge must often be checked. This is carried out by analysing sections taken throughout its length. Obviously small scale methods of analysis are ideally suited for this purpose.

Vulcanised Rubber Compounds

Wyatt[1] has described some micro methods used for the analysis of soft vulcanised rubber compounds. The methods were developed to analyse small samples of rubber insulation from an electric cable and may be easily adapted to other determinations which involve the extraction of small quantities of solids by solvents. Chloroform, acetone, alcoholic potash extracts, mineral filters, total sulphur and free sulphur in filters were determined satisfactorily. From the data obtained in these determinations it is possible to calculate the rubber content of the sample using the usual formula. Comparative results showed satisfactory agreement with the values obtained by the B.S. macro methods.

Wyatt[2] has also reviewed the application of microtechniques to the problems encountered in a railway laboratory. A micro version of the well known Dean and Stark apparatus is described in the review; this has proved invaluable for the determination of water in greases.

Petroleum Lubricating Oils

Micro methods have also been extensively used in the petroleum industry. Levin[3] has described a method for the determination of the viscosity of a few milligrams of petroleum lubricating oils. A capillary tube of such form as to avoid a variable hydrostatic head dips into the oil and the time of capillary rise is recorded. By calibration with oils of known viscosity, the time of rise is readily converted to absolute viscosity units. Cannon and Fenske[4] have discussed the operating characteristics of simple modified Ostwald viscometers which are suitable for covering a wide range of viscosity with accuracy. These workers also examined the more important sources of error in capillary viscometers and listed equations for computing the necessary corrections. Levin, Morrison and Reed[5] have described physico-chemical micro methods for the determination of the pour point of lubricating oils and the vapour pressure of petrol. Good results were obtained.

In the metallurgical field, micro methods are widely used, being applied to the examination of scales, segregations, inclusions and transitional material in welds. Klinger *et al*[6] preferred microanalytical methods for the determination of carbon, iron, silicon, manganese, phosphorus, sulphur, aluminium, nitrogen, chromium, nickel, molybdenum, tungsten, titanium and vanadium in iron and steel when destruction of the sample was impossible, or when large samples could not be obtained. The methods described for these elements are adequate for samples of 10-20 mg., and generally involve well-known photometric procedures. Vaughan and Whalley[7] have

presented a scheme for the microchemical analysis of most types of ferrous alloy in which all the more common steel-making elements may be determined satisfactorily. The analysis of a high-speed tool steel may be completed in 14 hours' working time.

One very interesting application of micromethods is their use by Wenger and Besso[9] for the analysis of 18th century Chinese porcelain. They were able to carry out a complete analysis without ruining the specimen, and determined silica, iron, aluminium, calcium, magnesium and the alkali metals by classical methods using only a 50 mg. sample. For work of a similar delicate nature Augusti[9] has described micro tests for pigments, in particular those likely to be used in painting.

Pharmaceutical Preparations

Micromethods have also been applied to control work in the manufacture of pharmaceutical preparations. In this respect Figdor[10] has reported satisfactorily on the determination of the alkaline earth salts of organic acids, the quantitative micro ash determination of drugs, the determination of residues in tinctures and fluid extracts, the determination of esters and menthol in oil of peppermint and of alkaloids in drugs and alkaloidal preparations.

Nagy and Dickman[11] have determined minute amounts of nicotine in tobacco smoke (*i.e.*, in the presence of pyridine) by precipitating with silicotungstic acid, dissolving the precipitate in a known excess of 0.01N sodium hydroxide and titrating the excess base with 0.01N hydrochloric acid using methyl red as indicator. 1 ml. of 0.01N sodium hydroxide is equivalent to 0.54 mg. of nicotine. Nagy[12] also determined the nicotine content of various plant insecticides by a similar procedure and obtained results in agreement with those obtained by gravimetric analysis of a much larger sample.

Mills[13] carried out an ultimate analysis of sewage using micro amounts of sample. Organic carbon was determined, after removal of inorganic carbon by oxidation with chromic acid using silver sulphate as catalyst, the evolved carbon dioxide being passed through a chromic acid scrubber and absorbed in barium hydroxide. Excess base was then titrated to a phenolphthalein end-point with hydrochloric acid. Nitrogen in sewage was determined by a micro-Kjeldahl procedure which is also accurate to 0.5 per cent. Iron, calcium and sulphur may be determined consecutively on the same sewage sample, while a modification of the well-known Pregl method gives excellent results for phosphorus.

The soap industry has found micro-analytical methods of special value. For example, a paper by Alber and Rodden[14] details methods used for the microchemical analysis of coloured specks and crystalline occlusions in soap bars. Using modified classical procedures these workers discovered the cause of the occlusions to be crystals of tin soap and sodium sulphate, the colouring being due to iron. During the course of this work a new platinum micro-filter boat was devised which permitted seven determinations to be carried out on a single sample weighing 1.3 mg. The solution to the problem is perhaps surprisingly simple, but nevertheless, a large amount of merchandise had been lost and the discovery of the cause was of considerable importance to the manufacturer.

Beutler[15] determined the cane-sugar content of small volumes of liquids by measuring the specific gravity and the specific rotatory power. Results of remarkable accuracy were obtained. Gravestein and Middleberg[16] used a microsublimation method for the detection in glass of 0.05 to 0.1 mg. borax. Fusion with sodium carbonate was followed by evaporation with hydrochloric acid, an easily collected sublimate of boric acid being obtained.

The installation of a micro laboratory is of particular importance in coal research work since a large part of such work is carried out with relatively small amounts of material. The coal molecule is so complex that one is certain to obtain a complex mixture of products from any reaction conducted upon it, and if a small amount of starting material is available, the problem is best solved by the application of microchemical techniques.

Water in Coal

A series of papers by Vetter[17] describes a microapparatus for the gravimetric determination of water in coal and modifications to the micro-Dumas method for the determination of nitrogen in tar. The principal alteration in this latter procedure is the introduction of a new design of azotometer enabling smaller volumes to be read more

accurately; the tube bore is reduced to ¼ of the original and a filtering appliance is incorporated, thus eliminating the need for a stop cock. Consequently a small volume of gas occupies more space on the scale and there is a considerably smaller error in measuring a very small volume. Kirner[18] has reviewed admirably the application of organic microchemical analysis to industrial problems. Although this work is outdated in view of recent developments in this field the paper provides a useful background to the subject. For example, the microchemical equipment of a coal research laboratory is described, and a large part of the paper is devoted to the sampling of industrial materials for microchemical analysis.

The same worker has also pointed out certain of the difficulties associated with the application of classical micro micromethods to the analysis of solid fuels and has discussed the advantages of certain modifications to these methods. These modifications are necessitated by the unique physical and chemical characteristics of solid fuels which involve among other things (1) their complex composition, (2) the low percentage of several of the constituents present, (3) the possibility of incomplete combustion of gaseous decomposition products, (4) their limited solubility in all solvents and (5) the lack of a definite standard to which analytical results can be compared.

Blix[19] adopted the Pregl methoxyl apparatus for the analysis of glycerine in fats and phosphatides, and obtained reasonable results on almost ultra-micro amounts of material. For the determination of the solidifying or melting point of mineral oils, paraffin wax, resins and fats, Dangl[20] has devised a micro apparatus involving the use of polarised light, while Szebellédy and Tanay[21] have determined the acidity of as little as 0.1 g. of castor oil by a microtitrimetric method. Again in connection with the analysis of industrial oils, Bowman[22] has described a microviscometer having an absolute accuracy of 4 per cent and a precision of 1 per cent in the range from 2 to 10,000 centistokes. The method is very simple and rapid and requires only 1 drop (about 30 mg.) of sample.

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Bulk Bitumen for Europe

THE first transatlantic delivery of bulk bitumen to one of the new Shell receiving depots in Europe took place recently in Denmark when 4,000 tons from Curacao, Netherlands West Indies, were discharged by the tanker *Liparus* (9,000 d.w.t.) at Provestenen, near Copenhagen.

This event marked the initial operation of a new programme to supplement European supplies by building bulk receiving depots in Denmark, Portugal and other European countries. Further depots are nearing completion in Portugal, at Setubal, south of Lisbon—where the first shipment is due at the beginning of June—and at Dublin, which should be ready next autumn. At these 6,000-ton storage depots, each of which will cost about £120,000, the bitumen, which is to be bulk-shipped in two basic grades, will be manufactured into the wider ranges of products that are required by users of this type of material.

To overcome the problem of transatlantic shipment of 'hot' bulk bitumen, Shell has converted three 9,000 d.w.t. tankers—the *Lembulus*, *Labiosa* and *Liparus*—each at a cost of £30,000. In these vessels the centre tanks, with a capacity of approximately 4,000 tons, have been specially equipped with coils and fitted with jacketed lines and pumps. The balance of the cargo in the wing tanks will consist of Black Oils.

For inland distribution in Europe, bitumen will continue to be supplied both in drums and in bulk, by road and rail bulk vehicles. Distribution in drums is necessary because some grades cannot be economically transported in bulk and drums enable purchases of small quantities to be made. It has been estimated that about 60 per cent of Western Europe's total bitumen demand can be supplied in bulk.

Royal Society Conversazione

Latest Chemical Developments on Show

AN interesting series of exhibits was on show at Burlington House on Empire Day, 24 May, when the Royal Society held a conversazione. Over 250 scientists are thought to have attended.

Chemical exhibits on show included a well set up example of the process and mechanism of selective flotation, made by the Colloid Science Department, Cambridge. The demand for basic non-ferrous metals like copper, zinc, tin, nickel, lead and chromium has made this method of separation of increasing importance as the high-grade ore deposits show signs of becoming exhausted; and the increasing demand for alloying elements such as cobalt, which are usually found in ores containing high proportions of other metals, usually make flotation the only economic method of separation in quantity.

Striking Examples

Striking examples of flotation were four erect tubes of water containing mixtures of ores or metals (copper and zinc, copper and brass, etc.) through which bubbles of air were passed from the bottom. The application of various reagents caused the separation of the two components. Theoretical knowledge of the mechanism of flotation has been gained by studying the interaction of metal ions with monolayers of the surface-active agent, and it is now possible to predict the method of separation of given ores and to recommend the surface-active agent to use. With long chain fatty acids, for example, the governing factor is the tanning of the monolayer by the basic metal ions, and this depends on the *p*H range of stability of the basic metal ion and the size of the hydroxyl unit. By varying these factors, selective flotation can be obtained. Moreover, different metal powders oxidise to different extents at a given temperature, giving a basis for selective flotation together with the specificity shown by different polar groups attached to the reagent. Examples of these methods were on view.

The effect of cross-linking of cation-exchange resins on their behaviour was shown by exhibits from the Chemical Research Laboratory of a range of resins and their absorption properties on two dyestuffs. The porosity of the resin used is determined to a large extent by the degree of cross-linking in the polymer molecule. Thus, if styrene is co-polymerised with different proportions of divinyl benzene, the products may be sulphonated to yield a series of cation-exchange resins of varying porosity. The highly cross-linked resins, having only small interlattice spacings, will not be able to absorb the larger cations, while the lightly cross-linked resin will absorb both the small and the large cations; the resin thus acts as a kind of sieve. The use of these resins for the purification of water and the recovery of metals and other valuable substances from water is well known.

Another chemical exhibit showed the new method of liquid/gas partition chromatography for analysing volatile substances, from the National Institute for Medical Research. By this method it is claimed that it should be possible to surpass the degree of separation obtained by distillation, and as it requires only 1/1,000 to 1,/10,000 of the amount of material, it should prove of great value to biochemistry.

The discovery of potassium salts in Yorkshire was represented by a varied selection of exhibits of specimen pieces of carnallite, sylvine and other ores, by I.C.I., Ltd. Some particularly fine pieces were on show containing 85 per cent. KCl, together with diagrams showing the strata encountered during the process of boring.

Cold Welding Aluminium

Finally, the welding in the cold of aluminium by means of applied pressure was on show by the research laboratories of the G.E.C. This is a new process whereby aluminium and its alloys can be welded together or to other metals such as copper, by a simple surface treatment with a steel wire brush followed by local mechanical pressure sufficient to cause appreciable flow. Examples were shown of a number of industrial applications of the process, involving 'spot' welding, ring-shaped welding for containers, and continuous welding for making tubes from sheet material. The method as now developed can deal with thicknesses of from ¼-3 mm.

Delay in Obtaining Plant Components

I.C.I. Report on Serious Effects to Chemical Industry

RECORD outputs for many of its products are shown in the report of the directors of Imperial Chemical Industries, Ltd., for the year 1950 to be submitted to its members at the 24th annual general meeting to be held at the Wigmore Hall, London, on Thursday, 14 June at 11.30 a.m.

Benefits are now being felt of the production from the new plants and extensions built under the company's post-war capital construction programme, a number of which came into operation for the first time during the year under review. Another important but unfavourable feature, which will have an increasing effect in 1951, is the shortage of raw materials which developed in the latter part of 1950 as a result of rearmament and stockpiling.

Exports in 1950 reached the record figure of £48.4 million, representing an increase in value of more than 25 per cent over the previous year. A substantial part of this increase was shipped to dollar countries, especially the U.S.A., Canada and Mexico.

Increasing Efficiency

Continued efforts have been directed towards increasing manufacturing efficiency by all possible means, such as improved processes, the installation of more efficient plant and machinery, and the application of method study and work study techniques. The most serious factor affecting the speed with which new processes and manufacturing methods can be brought into operation is the delay in obtaining supplies of manufactured plant-components of nearly every variety.

This is a problem with which most process industries are faced and its economic effects can be very serious, particularly in an industry like the chemical industry where processes and techniques are liable to rapid changes through improved knowledge, and where new processes and products are continually being evolved. The loss, by construction delays, of one or two years' production of a new product can have drastic consequences, especially in international markets.

It is, of course, fully appreciated that there are difficulties in the way of a return to the conditions which existed before the war, but the national benefit which would result makes it essential that every possible effort should be made to effect an improvement.

Alkali Division

Production of alkalis in 1950 was a record, being 10 per cent greater than in the previous peak year, 1948.

During the year the general demand for polythene, a plastic discovered and manufactured by the division, increased considerably so that, in spite of increased production, the company was unable to meet all requirements. A large increase in polythene plant capacity is, however, nearing completion.

General Chemicals Division

The demand for this division's products in 1950 was at a high level and increased throughout the year. In spite of production being a record for many products, there were periods when demand could not be met completely, but with the exception of sulphuric acid the shortages were not serious.

Shortage of sulphuric acid was not altogether unforeseen, and plans had already been made to convert a large part of the division's sulphuric acid plant, based on sulphur, to the use of other raw materials. This conversion is being carried out with all possible speed, and although it will not counterbalance all the sulphur shortage, it will assist materially towards that end.

Continued progress has been made in the replacement of old chlorine units by those of the most modern design, and largely as a result of this progressive replacement the output of chlorine in 1950 was higher than in any previous year.

Dyestuffs and Pharmaceuticals Divisions

During 1950 the sales of Dyestuffs Division products reached a record level but both volume and value would have been greater had the materials been available.

The Home sales exceeded in value those of 1949 by 29 per cent. Thirty-two new dyestuffs and nine non-dyestuff products were added to the range during the year.

Arrangements have been made for the purchase of a 350-acre site in Cheshire on which it is proposed to build a research and

administrative headquarters for the Pharmaceuticals Division.

Billingham Division

The year 1950 was a year of high activity, and record productions were achieved in ten major products. New plants were brought into operation for the manufacture of synthetic phenol and additional nitric acid at Billingham, and for additional ammonia at Heysham.

Unfortunately, world sulphur shortage is threatening superphosphate and ammonium sulphate supplies, and the division has therefore been giving thought to the use of nitric acid instead of sulphuric acid in the production of phosphate fertilisers, and to increased production of sulphuric acid from an indigenous raw material, anhydrite, of which there are ample reserves in the United Kingdom. Field trials of laboratory preparations of a nitro-phosphate fertiliser were made during the summer of 1950, and a pioneer plant for the production of larger quantities is now being erected.

Nobel Division

Manufacture of 'Ardil' fibre extends the company's interests in the textile field by the production of a staple fibre which can be processed on existing textile machinery.

Plastics Division

Availability of more plant combined with increased efficiency made it possible to respond in large measure to the heavy calls made on all plants in 1950.

A small pioneer plant has come into operation for the production of 'Terylene' continuous filament yarn, and it is expected that during 1951 extensions to this plant will enable it also to produce staple fibre.

Development of this new polyester fibre is now so far advanced that it has been decided to erect a full-scale commercial plant, with a capacity of 11 million lbs. per annum, at Wilton Works.

Wilton Works

Plants for the production of polythene, formaldehyde and a-naphthylamine are nearing completion, closely followed by plants for ethylene oxide, ethylene glycol and 'Lissapol' N detergent, and when these plants come into operation in 1951 the Alkali, Billingham and Dyestuffs Divisions will join the Plastics Division in becoming producing divisions at Wilton Works. Sitework started during 1950 on the General Chemicals Division's chlorine plant, the first unit of which should come into production towards the end of 1952.

Research and Development

Various large-scale plants for the manufacture of new products are approaching completion at Billingham, and some of these products, such as para-octyl phenol, an important oil additive, and 'Topanol' A petrol antioxidant, are already successfully established on the selling range.

Long-chain alcohols, which are used in the manufacture of certain types of synthetic detergent, have been made successfully, on a small scale, by a new catalytic hydrogenation process developed at Billingham, and data obtained for the design of a full-scale plant. Pioneer plant output of the existing development range of alkylamines has been increased in view of increasing interest in these products, and preliminary work on additional products in this series is proceeding. On a smaller scale, development work on a number of furfural derivatives has continued.

A small pioneer plant has been built for the experimental manufacture of polymethyl α-chloracrylate, a new glass-clear plastic, discovered in the company's laboratories, and although similar in many of its properties to 'Perspex', it is stronger and more resistant to solvents and to 'crazing'.

Potash

The deep-drilling investigation being undertaken near Whitby has made good progress, and during the year two more exploratory boreholes have been started. Before the end of the year full results had been obtained from three boreholes, and it was possible to announce in October, 1950, that valuable deposits of sylvinite have been proved in the area so far investigated.

Canadian Liquid SO_2 Plant

A new plant to produce 90,000 tons of liquid sulphur dioxide a year from by-product gases of the oxygen flash-smelting processes recently developed by the International Nickel Company, will be erected at Copper Cliff, Ontario, Canada, by Canadian Industries, Ltd. At present Canada obtains liquid sulphur dioxide from the United States, but consumption is small, due to the high cost. The Copper Cliff plant's output will be available to consumers at a fraction of the cost of the United States product, it is said. In 1950 Canada imported more than 385,000 tons, valued at about $7,500,000.

Rearmament's Effect on Industry

Chairman Stresses Need for Allowances Revision

NET sales of Monsanto Chemicals, Ltd., during the year ended 31 December, 1950, exceeded budget estimates by 7 per cent, and were 41 per cent above the 1949 record, according to the chairman's statement to be presented at the 17th annual general meeting to be held at Winchester House, Old Broad Street, London, at 11.30 a.m. on Thursday, 7 June.

Less than 5 per cent of the increase in sterling worth of goods sold is to be attributed to increases in selling prices. The bulk of the additional volume of business came from the incidence of greater production at the new factory at Newport, while production efficiency at the Ruabon factory, where most of the major expansion was completed by the end of 1949, was greatly increased through improved methods and emphasis on operating and cost control.

At Newport, all manufacturing processes contemplated in the original programme for this location were in production at the end of the year. Most of the units have been developed to maximum capacity, some to extraordinary production records, and although due to recurrent shortages of raw materials consistent full production was impossible, nevertheless the rate of sales of Newport products during the last quarter of the year exceeded the target for that period.

Additional Units Completed

Additional units brought into production during the year included plant for the manufacture of pentachlorophenol and derivatives used by the paper, timber and agricultural industries; for chlorine and caustic soda required chiefly for use in their other manufactures; a second unit for the manufacture of chemicals for the detergent field; plants for the production of the selective herbicide 2: 4—D and the new insecticide Niran (parathion); and the plant for the production of the plastic polystyrene. The manufacture of polystyrene in the new plant at Newport provides a United Kingdom source of this versatile plastic in commercial quantities.

Engineering and purchase of equipment for the construction of the Styrene Monomer plant at Grangemouth for Forth Chemicals Ltd., in which Monsanto have a one-third interest, has proceeded on schedule and construction started early in 1951.

Considerable progress has been made by the new subsidiary, Silicon (Organic) Developments Limited, in manufacturing Silicon Esters for the engineering industry at the small plant at Bridgend, Glam. Plans are nearly completed to transfer these operations to Newport where they will have new and expanded manufacturing facilities.

Crucial chemical raw material shortages began to develop in 1950, and are expected to be more acute this year. The major shortage is of sulphur from the U.S.A., which appears likely to be of long duration. It is estimated that conversion to the use of pyrites and anhydrite to overcome the difficuty in the U.K. may take up to five years.

Expansions Under Way

Capacity for purifying benzol for chemical use is only equal to present requirements, but work is being carried out in conjunction with other users and producers to provide both short and long term expansions to cover the needs of industry. Planned expansion of phthalic anhydride manufacture will require the country's full production of crude naphthalene, and additional refining capacity must be provided.

Production of coal in the U.K. has not kept pace with the increasing needs of industry, and there seems to be little hope that the situation will be corrected in the foreseeable future. The incidence of major increases in oil refining capacity in the country during the next two to five years may help to offset this fuel problem, but crude oil is not indigenous.

At the time of writing (states the report) no policy in respect of diversion of materials and effort from normal to a wartime economy has been detailed to industry. Nevertheless, the proposals for the expenditure of approximately 10 per cent of the national income in 1951 for rearmament will result ultimately in major dislocations in industry.

All these factors present industry as a whole with the most difficult of tasks in

maintaining full productivity and efficiency.

Continuing, the chairman states:—

The burden of overall taxation in one form or another seems certain to increase as a result of world conditions, in the absence of stringent Governmental economies. Even at present levels taxation of company profits offers little incentive to industry to accept the risks and problems of expansion. The F.B.I. have put forward sound suggestions for correcting these conditions and there is one point in particular on which I should like to add something.

Rearmament involves the provision of buildings and plant not only for the direct production of armaments but also for the increased production of many things without which the production of armaments cannot be expanded. The State will no doubt provide the capital equipment required for direct armament production but it is apt to rely on industry for the indirect requirements.

Allowance Needs Revision

It is my belief that for any project of that indirect nature found to be necessary in the interests of the national economy during this rearmament period, the State should revise the present initial and wear and tear allowances so as to allow capital expenditure to be written off in equal instalments over five years.

Monsanto Chemicals (Australia) Ltd. has continued to expand its manufacture and reported record sales during 1950. The rate of growth of this company, in which we have the controlling interest, is very satisfactory. One of our directors visited our Australian associates during the year, and made a complete survey of industrial activity in the country.

Expansion will continue at an increased rate, and at the end of the year our associates there announced the approval of a project for the construction, at a cost of £A250,000, of a plant to manufacture polystyrene.

Expansion of activities of Monsanto Chemicals of India Ltd. to embrace manufacture in India continues to be studied jointly by Monsanto Chemical Company and ourselves, but the very unsettled conditions existing in that country and the East as a whole are likely to delay any action on our part.

Considerable capital expenditure has continued on the improvement of research facilities. There are now two modern laboratories for research and development and a large force of experienced chemists and engineers entirely devoted to this work. They operate in close and constant contact with universities, research institutions and other bodies in this country and abroad.

Thus, the stage has now been reached where by our own efforts we can contribute effectively, and in increasing measure, to chemical progress.

The present agreement with our parent company in the U.S.A., under which the American company furnishes us with technical information and assistance, expires on the 31 December, 1951, and a new agreement has been made to take effect on the 1 January, 1952.

An annual fee of $150,000 will be paid to the American company and if, after the 31 December, 1951, we use their experience and processes in the manufacture of new products or of old products by new methods, we shall in addition pay them a reasonable royalty on our sale of those products.

Festival Science Films

A SERIES of programmes of scientific films from British and Commonwealth sources has been arranged in the South Kensington Science Exhibition cinema at hourly intervals from 1 p.m. each day. This cinema seats 100. The programmes will continue for five months and the first programmes are listed below.

Programme A

'Atomic Physics' Part 1: 'Chemistry of Atoms'—Gaumont British Instructional, Ltd.

'A Hydro-Carbon Story'—presented by Shell. Specially compiled for the Festival of Britain.

Programme B

'Atomic Physics' Parts 1 to 5. Gaumont British Instructional, Ltd.

Programme C

'Challenge—Science Fights Against Cancer.' National Film Board of Canada.

Programme D

'Colour.' Presented by I.C.I.

'The Nature of Plastics.' Presented by Messrs. Bakelite.

'The History of the Discovery of Oxygen.' Presented by I.C.I.

Metallurgical Section

Published the first Saturday in the month

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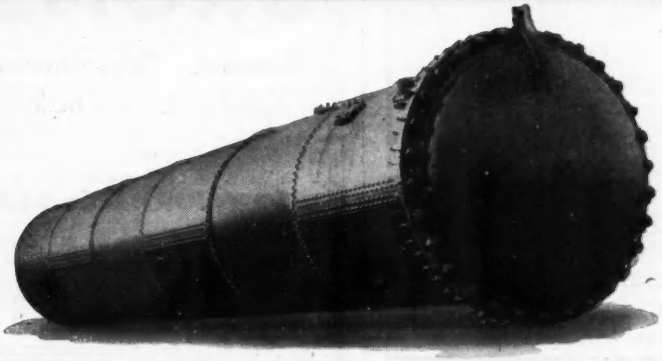

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Metallurgical Section

Recent Developments in Casting Alloys

British Reluctance to Adopt New Methods

MUCH valuable information on the properties of various cast irons and many different alloys was given by Dr. Irvine, lecturer in metallurgy at Leeds University, in a paper delivered to the West and East Yorkshire branch of the Incorporated Plant Engineers on 30 April.

In technical development Great Britain is in a strong position and in the cast iron industry Americans admit that we are ahead of the United States. Two factors, however, count against us:—

1. The users in Great Britain are not sufficiently aware of technical developments;

2. Owing to delays in the issue and bringing up to date of British Standard Specifications to cover all the new metals, their use in this country is limited.

As an example of malleable cast irons, Dr. Irvine mentioned that the Americans make far greater use of them than we do. Malleable cast iron is reheated after casting and this adds to the cost.

The standard specified properties of malleable iron show that Blackheart has a tensile strength of 20 tons per sq. in., an elongation of 7½ per cent and will bend through 90°. Whiteheart has the same tensile strength, but its elongation is 5 per cent and it bends through 45° only. Actual properties obtained are appreciably greater than these figures.

Pearlitic malleable iron may be quenched and tempered, but without this treatment its tensile strength is 30 tons per sq. in. It will bend through 180° round a 1 in. radius.

Nodular cast irons give equivalent properties on casting, that is without heat treatment.

At the time of casting, magnesium nickel alloy is added to the molten iron. The magnesium reacts violently with the sulphur impurities and a nodular graphite replaces the elongated form of carbon particles which are characteristic of irons with sulphur impurities. The nickel in the compound goes into the iron. It is only required because magnesium alone would react dangerously.

Cerium was once used for de-sulphurising and this reacted violently in the same way. It was too expensive and was replaced. The quantity of sulphur remaining after this process is as low as 0.001 per cent.

The tensile strength of nodular cast iron is 35 tons per sq. in. and its elongation 10 per cent to 15 per cent.

Developments in aluminium alloys were next considered. This metal came into prominence in 1920. Its main advantages are low specific gravity and good corrosion substance properties. Its main disadvantages are very high shrinkage on casting and low strength.

The following alloys were dealt with in ascending order of merit:—

1. Aluminium zinc—18 tons per sq. in. tensile strength. Zinc being heavier spoils the low weight factor. Corrosion-resistance is also impaired.

2. In 1920 aluminium copper (4 per cent) —18 tons per sq. in. tensile strength. The shrinkage following casting is reduced.

3. Aluminium silicon. About the same tensile strength as the other alloys, but silicon is of low specific gravity. This alloy goes under the trade name of 'Alpax'.

4.—In 1929 aluminium magnesium (3-5 per cent). About the same strength, but even lighter than the other alloys, magnesium being even lighter than aluminium.

Other alloys have been developed from time to time, one of the best known being the National Physical Laboratory Y. alloy, better known as Duralumin. This contains 3.5 per cent copper, 2.2 per cent magnesium and 2 per cent nickel.

In the manufacture of many aluminium alloys, age hardening is resorted to. Broadly speaking this consists of heating the alloy

to dissolve the copper, for example, and allowing it to cool. In this way the copper, on decomposing, is deposited evenly throughout the metal. After heating and quenching, the age hardening may be completed in about three hours at 150°C. At room temperature it takes about three days.

The properties of these alloys in general tend to be eliminated when the temperature increases.

Great Britain Backward

In the search after lightness, magnesium was an obvious possibility, being even lighter than aluminium. Unfortunately, Great Britain was backward in the production of this material. However, considerable developments in production of alloys were made during the war.

Magnesium zinc and magnesium aluminium alloys at 8/15 tons per sq. in. were examples quoted. The addition of zirconium to the last mentioned resulted in an alloy having the remarkable combination of a strength of 18 tons per sq. in. with a specific gravity of 1.8.

Dr. Irvine said that many people refused to depart from old customs and this delayed the development of the alloy industries. As an example it was interesting to compare the use of cast iron in looms used for the old established cotton industry with the use of new alloys in looms for nylon.

Zinc base alloys were discussed next with their particular suitability for die casting. These contain not more than 0.003 per cent lead and a total alloy content of not more than 0.01 per cent.

With a tensile strength of about 20 tons per sq. in. and elongation 8-10 per cent, this metal has an IZOD impact figure of 40 ft./lb. It is better than any other casting metal and is definitely not brittle.

In die casting it will faithfully reproduce holes 0.03 in. diameter and screw threads at 24 to the inch. Die casting with zinc base alloys has the two great advantages that no machining is necessary, and 100,000 castings can be made from one die.

Special copper base alloys were the final group of metals to be described. Their development is completely new, and they combine high conductivity with good strength. Copper itself has a high electrical conductivity and low strength. The addition of materials to improve the strength usually spoils the conductivity. This was to be expected, explained Dr. Irvine, as a high electrical conductivity resulted from purity and an undistorted lattice, whereas physical strength improved with the admixture of other materials and as the distortion of the lattice increased.

Beryllium is the most successful material to be alloyed with copper but, unfortunately, this costs £60,000 per ton. The 80 tons per sq. in. tensile strength is the best obtained by any material and is as good as the best steel alloy.

A great deal of research has been done, but in order to keep this within practicable bounds, detailed investigations were finally confined to beryllium, chromium, cobalt, titanium and zirconium.

1. Copper beryllium (2 per cent) has outstanding mechanical strength and good conductivity, but is too expensive.

2. Copper chromium (0.6 per cent) has a tensile strength of 35 tons per sq. in. and is an excellent conductor (80 to 90 per cent on the International Conductivity Scale); in fact, pure copper, aluminium or silver are the only better conductors known.

3. Copper cobalt has good mechanical and conductivity properties but not as good as copper chromium.

4. Copper titanium is about the same as copper cobalt, but has the disadvantage of being reactive.

5. Copper zirconium (1 per cent) has excellent mechanical properties and good electrical conductivity. This is a recent development.

6. Copper 99.4 per cent, chromium 0.4 per cent and beryllium 0.1 per cent gives excellent strength and 70 per cent on the International Conductivity Scale. Owing to the very small quantity of beryllium involved, the price factor is largely overcome.

A Further Illustration

A lively discussion followed, during which Dr. Irvine gave further useful technical information. A further illustration was produced of our slowness in this country in keeping up to date. For a considerable time pure aluminium has been used for canning foods in other countries. In this country, however, we insisted for a long time on continuing to use tin plate. Consequently, instead of using the aluminium plate which was available at the canning centre, it was necessary for us to go to the trouble of exporting tin plate to the countries supplying the tinned foods to us.

Chromite Investigations in South Africa

Utilisation of Transvaal Ores

THE large and increasing demand for chrome ore in the world markets, particularly in the U.S.A., emphasises the importance of developing methods for the wider utilisation of South African deposits in the Transvaal.

Application of chromite, the characteristics of the Transvaal ores and possible methods of processing them were surveyed by I. H. Kahn and A. M. Schady, of the National Chemical Research Laboratory, South African Council for Scientific and Industrial Research, Pretoria, in the *Journal of the Chemical Metallurgical and Mining Society of South Africa* (Vol. 51, No. 8), from which the following is abstracted:—

In 1945 the world consumption of chromite had risen to two million tons per annum, this ore being consumed in the following percentages: metallurgical uses 45; refractory 40; chemical 15.

South African chromites generally fall short of the criteria for metallurgical and refractory uses and are really only directly suitable for the production of chemicals, which is only a small fraction of the total consumption.

Unless some method of beneficiating the ore can be developed which will make it acceptable for metallurgical and refractory purposes, the market is therefore limited.

Development of an economic method for the production of ferrochrome of acceptable grade from South African chrome ores is therefore a most important technical problem for the chrome industry.

Treatment of the Ore

Chemical reduction of chrome ore may lead either to the direct production of ferrochrome or the upgrading of the ore, depending on the process used.

Ferrochrome: In the manufacture of chrome and stainless steels the chromium is introduced in the form of ferrochrome, of which several grades are produced with varying carbon contents.

The manufacture of ferrochrome is essentially reduction, in an electric furnace, of the iron and chromic oxide constituents of the ore to form an alloy containing 65-72 per cent chromium, the remainder being iron and carbon together with traces of other elements. The alumina, magnesia and other constituents of the ore are removed as a slag, the process taking place above the melting point of the charge.

High carbon ferrochrome for the manufacture of low chrome steels is produced with coke as the reducing agent. The carbon content ranges from 4 to 9 per cent. Low carbon ferrochrome for the manufacture of stainless steels requires silicon as the reducing agent to keep the carbon within the limits of 0.03-2.00 per cent.

Ferrochrome manufactured in South Africa at Vereeniging (about 800 tons in 1948) contains only about 62-64 per cent chromium owing to the use of local ore below metallurgical grade specifications. The carbon content of chrome steels is affected by the carbon and/or chromium content of the ferrochrome used. This fact is of importance. Reducing the carbon content of the ferrochrome could compensate for the lower chromium content but would lead to increased production costs.

Sub-Standard Ferrochrome

The feasibility of producing a sub-standard ferrochrome from low grade ores is discussed by Wassel and Rasmussen. These investigators believe that ferrochrome of chromium content lower than specified in present standard grades can be used in the manufacture of certain alloy steels without serious technological difficulties.

Development of an economic beneficiation process to produce a concentrate complying with metallurgical specifications would solve the problem of utilising South African high-iron chrome ores. Investigators at the United States Bureau of Mines (USBM) have shown that conventional ore dressing methods leave the chrome spinel structure unaltered and it is only by some chemical means that the chromium-iron ratio of the mineral can be improved.

Chemical beneficiation—gaseous reduction: Hammarberg, working in Sweden, suggested a process involving initial oxidation of the chromite which, he claimed, caused the rupture of the spinel structure. Preferential reduction of the iron oxide to the metallic state was achieved by subsequent reduction with hydrogen. It was

claimed that the resulting metal could be removed by magnetic separation.

Preliminary work on Transvaal chromite seems to indicate that the full extent of the patent claims cannot be reproduced with this ore, but a modification of Hammarberg's procedure might lead to a workable process.

With an eye to strategic circumstances the USBM embarked on an extensive programme of chemical beneficiation. Their approach was the preferential reduction of the iron oxides in the ore to Fe and FeO, leaving the valency of the chromium largely unchanged.

Acid leaching was used to remove the iron, leaving a residue that, after sintering, complied with metallurgical specifications. Washed concentrates mixed with coke were fed into a rotary furnace at a temperature of about 1,350°C. It was found that lower temperatures could be employed using a gaseous mixture of methane and hydrogen. No detailed leaching tests were carried out, but it was found that most of the iron could be removed with dilute sulphuric acid. No cost estimates were given, but it was generally felt that such a process would be uneconomical except in times of emergency.

The process is, however, of potential interest in South Africa as the ferrous sulphate derived from the leaching operations might well find application in the large-scale processing of low grade manganese ores.

Metallic chromium: Production of metallic chromium by chemical reduction processes is covered by the alumino-thermic and silicon reduction processes. The reaction is carried out in an electric furnace according to the equation:

$$2\ Cr_2O_3 + 3\ Si = 4\ Cr + 3\ SiO_2.$$

Metal of about 97 per cent purity can be obtained.

During the last ten years or so the U.S.A., Australia, and Russia have investigated the dissolution of the ore with a view to obtaining the chromium fraction in a readily usable form for subsequent processing.

It was hoped that the direct acid treatment of the ore would provide an economic alternative to the older established method of roasting with soda ash.

Generally speaking, exploitation of the direct dissolution process offers considerable possibilities. It offers a combined process for supplying both chemical and metallurgical markets and must not be overlooked.

Chlorine Metallurgy

Chlorination of the chromite mineral offers a practical method of effecting the separation of chromium from other constituents of the chrome spinel and of improving the chrome-iron ratio of the ore. In spite of the technical and physico-chemical difficulties associated with high temperature chlorination, the process has great advantages.

Two methods suggest themselves for the recovery of the metal from chromium chloride, namely, electrowinning and hydrogen reduction. There has been no specific literature dealing with the electro-deposition of chromium from chloride solutions, but should this prove feasible chlorination coupled with electrowinning would provide an attractive approach economically.

Hydrogen reduction of chromium chloride to produce sponge chromium has been investigated on the laboratory scale.

The alternative approach to chlorine metallurgy, namely, selective chlorination of the iron to improve the chromium-iron ratio of the ore has been advocated. Use of higher sulphur chlorides or carbon monoxide, it is claimed, allows preferential chlorination of iron in the mineral and inhibits the chlorination of chromium.

Chlorination achieves a rapid disruption of the chromite and provides a convenient way of separating the chromium from the other constituents. In this respect it seems to offer advantages over the acid dissolution process which means purifying the digestion liquor.

Such a process would also provide a market for any surplus chlorine obtained from the electrolytic production of caustic soda.

Alkali Fusion

The greater part of the 15,000 tons of chrome used per annum locally is converted into chrome tanning salts, dichromate, chromic acid and chrome pigments. The output of three plants is used to supply domestic needs, the balance being exported.

Only about five per cent of the Union of South Africa's requirements of soda ash are produced locally, the remainder being imported from East Africa and elsewhere. Factors such as price and availability of soda ash and acid must be considered when visualising a large expansion in the local production of chrome chemicals. In addition, the export market for chrome chemicals is highly competitive.

Apart from these economic considerations there appear to be no major problems associated with this mode of processing.

French Iron & Steel

Location and Metal Content of Ores

IRON production in France was the largest in the world in 1932-3, but first place was lost to the U.S.A. in 1937. Metal content of the ores used varies considerably, and averages about 33 per cent. The Lorraine district is the principal source of iron ore, the formations being in the Upper Lias in seven strata more or less horizontal, covering an area of about 290,000 acres. In the north of this region are the Briey mines—the largest producers, the Metz (Thionville) mines, and those of Longwy. In the south are the smaller reserves of Nancy.

Formations are mostly regular and sufficiently thick to permit mechanical working. Mining is fairly easy: towards the east the ore outcrops on the sides of the Moselle and in the valley of the Fentsch and Orne. Extraction is by galleries and sometimes by surface mines or shafts (Briey) never exceeding 240 metres. The gangue is frequently calcareous.

Lorraine ore has two defects: the brown hematites or main constituents have only 28-40 per cent iron content, and contain a relatively high percentage of phosphorus which, until the introduction of the Thomas and Gilchrist methods, considerably limited their use.

Other French iron reserves are in Normandy towards the north, and the Pyrenees in the south. The formations are associated with Silurian rocks markedly folded or plicated and even dislocated. They extend from Cherbourg (Diélette) to Alencon through the Normandy Bocage.

Irregular Iron Content

The Armorican sandstones of Chateaubriant extending to Segré with magnetites or red hematites are of very irregular iron content, ranging from 20 to 45 per cent. Some of the Normandy hematites reach 55 per cent, while the carbonates are lower at 30-40 per cent. All are essentially silicious. The iron ore deposits of the Pyrenees extend from St. Etienne and Baigorry to the eastern Pyrenees, the most important being in the east at Tarascon-sur-Ariège, and especially on the sides of the Canigou. They are mostly hematites of 50-55 per cent content, free from phosphorus, but containing 3-4 per cent manganese.

These particulars are supplied by Mlle. Tudurt (*Chim. and Ind.*, 1951, *65* (3), 410-412) who also adds some tabulated data on French iron and steel production. France occupies fifth place in world output.

In 1949 processes used were: Thomas 62 per cent, Martin 30.1 per cent, electric 6.3 per cent, others 1.6 per cent. Distribution by district was: east 69.5 per cent, north 20.2 per cent, others 10.3 per cent.

Wrought Metals

American and British Methods Compared

FINDINGS of the productivity team representing the Wrought Non-Ferrous Metals Industry which visited the U.S.A. last year, have now been published by the Anglo-American Council on Productivity.

In America during its six weeks tour, the team visited some 20 plants. Productivity was found to be definitely higher in the U.S.A. than in the U.K., although quality of product was certainly no better. Functionalism was the criterion by which the quality of the product was measured.

From the works visited it was found that there was much in American casting, rolling and tube-drawing technique and practice which could be followed to advantage in this country. In wire-drawing there seemed to be little difference in productive efficiency, while in the extrusion process British practice was considered to be more efficient in a technological sense than American.

Machines and techniques are dealt with in the report under the appropriate process headings, but in the general observations it is noted that it was almost universal for annealing in U.S. plants to be carried out by a continuous process, the furnaces for the most part being of the roller-hearth type.

An increasing tendency to install stainless steel boshes for sulphuric acid pickling, in the place of the older type lead-lined bosh, was also observed.

Copies of the report (4s. 6d., post paid), may be obtained from the British Non-Ferrous Metals Federation.

Acting Director Appointed

New Metallurgical Laboratory Chief

FOLLOWING the resignation of Professor Charles Crussard as Director of the National Metallurgical Laboratory of India, Dr. G. P. Contractor has been appointed Acting Director.

Born in Bombay in 1907, Dr. Contractor obtained his B.Sc. degree from the University of Bombay in 1924, securing first class honours. Later he served as a lecturer in geology and demonstrator in chemistry at the St. Xaviers College, University of Bombay, and prepared his thesis for a M.Sc. degree. Subsequently Dr. Contractor was sent to England by the University for studies in metallurgy. He obtained his Ph.D. degree in the year 1939 and was awarded the Henry Cort Medal of the Honours School of Metallurgy, University of Manchester.

On his return to India after practical training in Germany and Scotland, Dr. Contractor joined the firm of Messrs. Tata Iron & Steel Co., Ltd., Jamshedpur, as Senior Research Metallurgist. During the war period Dr. Contractor was responsible for carrying out extensive researches into the development of various ordnance steels, ferro alloys, and specialised steels such as electric steel sheets, etc., in collaboration with the workers of the Tata Research Laboratory.

He joined the Council of Scientific and Industrial Research in November, 1944, as Assistant Director (Planning) for the establishment of the National Metallurgical Laboratory for India. In this position he was mainly responsible for planning and organising the National Metallurgical Laboratory of India which was opened on 26 November, 1950.

Dr. Contractor is at present the vice-president of the Geological, Mining and Metallurgical Institute of India.

Welding Research Competition

A SINGLE prize of £100 is again offered by the British Welding Research Association for the best paper on a research into welding or its application, submitted in 1951.

This is the continuation of an offer made by the British Oxygen Company, Ltd., in 1948 to provide a prize fund for a competition relating to welding for three years. In the first year no award was made, but 1949/50 the prize was won by K. Winterton, C. L. M. Cottrell, and J. G. Ball for their paper entitled 'A New Weldability Test for Magnesium Alloy Sheet.' The result of the 1950/51 competition has not yet been arrived at.

Candidates for this year's award must not be more than 35 years of age on 1 January, 1951. The work submitted must be an original unpublished paper on a research into welding or its application carried out in Great Britain or Northern Ireland.

Brevity consistent with lucid exposition of the research will be an advantage. Papers should not exceed 5,000 words. Copyright of the prize-winning paper shall be the property of the British Welding Research Association.

Papers must be submitted on or before 31 December, 1951.

Tin Research Institute

A NEW electroplate 'tin-nickel' discovered at the Tin Research Institute was seen for the first time when its new laboratories at Greenford, Middlesex, were opened by the Duke of Gloucester on 31 May.

The new electroplate is an alloy made by the simultaneous deposition of two parts of tin to one part of nickel. The process is simple and trouble free and the coating is claimed to remain permanently brilliant under adverse outdoor conditions. The colour tone of tin-nickel, which promises to be a serious rival to chromium, is a faint rose.

Five other alloy platings invented at the Institute's laboratories will also be on view. Other sections will demonstrate research on hot-dip tinning, soldering and the mechanical testing of tin alloys, including babitt metals.

The Tin Research Institute originated in 1927 and is an unique example of international collaboration for research. Funds for the work are subscribed voluntarily by the mining organisations of various countries, but the results of researches are published and distributed free to all users of every nationality.

Researches are mainly carried on at the Institute's Greenford laboratories, but certain work is entrusted to specialist laboratories both in England and overseas.

Importance of the Chemical Engineer

Vital Link Between Discovery and the Consuming Public

CHEMICAL engineers from both coasts and many other sections of the country took part in the Midwest meeting of the American Institute of Chemical Engineers, held in Kansas City, Missouri, from 14-16 May.

During the meeting which was attended by some 800 of the institute's 12,000 members, discussions were held on newly developed methods of chemical synthesis, ammonia production and petroleum refining. Plant safety measures were also stressed and one session was devoted to the financing of chemical plant expansion.

Chemical engineers, stressed C. W. Nofsinger, chairman of the meeting, are the vital link between chemical discovery and the consuming public. Although the chemical industry in America was practically non-existent 50 years ago, recent estimates showed it to be worth at least $10 billion to-day, exclusive of the closely related petroleum, food and rubber divisions. Its size had doubled in the last 10 years.

'How fast will it go?' is a universal question as far as chemical engineers are concerned according to Bernard W. Gamson, of Great Lakes Carbon Corporation, who presided at the opening technical session of the A.I.Ch.E.

Manufacture of such varied items as soaps, cereal, high-octane gasoline, synthetic rubber and plastics all have a common basis in the science of 'Reaction Kinetics'. 'By measuring the speed of chemical reactions', Gamson explained, 'the engineer is able to design more advanced and more efficient equipment to manufacture the many new products now being developed in the research laboratories of industry, the government and schools'.

Reaction Kinetics

Papers presented at this session reported work finished or in progress at the laboratories of the University of Michigan, the University of Washington, Perdue University and Northwestern University. 'Reaction Kinetics is a very technical and theoretical branch of our profession', said Gamson, commenting on the abundance of complicated mathematical formulae used in the presentation of the papers, 'but it is the basis for practical developments in all branches of industry'.

How hydrogen sulphide gas has been harnessed by several different processes to yield sulphur was described in a paper by B. W. Gamson and R. H. Elkins on work done at the laboratories of the Great Lakes Carbon Corporation. Several industrial processes yield this gas as a by-product.

Original Application

Purification of coal gas used as heating fuel was the original application of the sulphur-recovery process; however, natural gas and petroleum are now supplanting coal as the principal source of waste hydrogen sulphide. The advent of the catalytic cracking process and the increased use of high sulphur crude oils have greatly increased the interest of the petroleum industry in the process, according to the authors. The discussion included a review and comparison of known methods of sulphur recovery.

'Activated charcoal, similar to the material used in some gas masks, has found industrial application in a process known as hypersorption', stated Clyde Berg, of the Union Oil Company of California, in presenting a technical paper.

Activated charcoal is of a special type processed so that it has many microscopic holes like a tiny sponge. Hypersorption is used in the petroleum and chemical industries and is based upon the 'soaking up' of gaseous material by the charcoal. Activated charcoal will absorb the heavier components of natural gas to a greater degree than the lighter parts and thereby permit a separation of gases from which chemicals such as anti-freeze, plastics, alcohols and liquified petroleum gas can be prepared.

Modern trends in gas plant design were discussed by F. E. Gilmore and R. D. Bauer, of Phillips Petroleum Company, at the same meeting. 'The need for efficient gas recovery has been accented by the increasingly important rôle of catalytic cracking in the refining of petroleum products', they said.

Radioactive carbon can be used to simplify complex engineering studies, according to Dr. J. O. Maloney, chairman of the department of chemical engineering of the

University of Kansas. A minute portion of carbon-12 normally present in alcohol molecules can be replaced by radioactive carbon-14, thus 'tagging' the alcohol for identification by means of a Geiger counter even after it has been mixed with different liquids.

Use of carbon-14, he explained, aids in the investigation of distillation and diffusion processes by replacing long tedious analyses of separated liquids, by relatively easy electrical measurements. By determining the radioactivity of the liquid, the amount of alcohol present is found. These two tests were not practical until radio-isotopes such as carbon-14, were produced on a commercial scale by the chain-reacting uranium pile.

Dr. Maloney stated that carbon-14 is not dangerous to handle. It slowly decomposes into nitrogen with the emission of beta rays, but according to measurements, 5,000 years would be required for 50 per cent of it to change. These studies at the University of Kansas were originally supported by the Office of Naval Research, but are now sponsored by the Atomic Energy Commission.

Converting refinery or natural gas to permanent anti-freeze is commercially possible according to P. C. Davis, C. E. Von Waaden and F. Kurata, chemical engineers from the University of Kansas, where experiments were made which will permit design of large-scale plant equipment.

Logical Raw Material

'Increased refinery and natural gas production makes gas the logical raw material, especially in the midwest area', said the authors. 'The commercial possibilities of the process promise to aid in keeping permanent-type ethylene glycol anti-freezes in full supply.'

Although the basic chemical reaction has been known since 1860, it has been only recently that industrial application has been explored. The process can also be used to synthesise raw materials for making resins, explosives, and plastics.

A novel feature of the meeting was a mock 'Stockholders Meeting" of a hypothetical chemical company, with John R. Riley, Jr., vice-president of Spencer Chemical Company, serving as 'President'. The chemical engineers in attendance participated as 'Stockholders' and the 'Management's' judgment in considering an expansion programme for the 'Company' was questioned.

The meeting concluded with a symposium relating to the 'Synthesis and Uses of Ammonia'. Particularly the improvement in the synthesis of this chemical and its outstanding value in agriculture was emphasised by engineers from the Spencer Chemical Company, Tennessee Valley Authority, The Chemical Construction Corporation, The Mississippi Chemical Corporation, and the Girdler Corporation.

Steel Production Problems

THE steel position as it seems likely to develop during the remainder of the year and some of the problems at present confronting the industry are surveyed by the British Iron and Steel Federation in the April issue of its *Monthly Statistical Bulletin* (Vol. 26, No. 4), published this week.

Production should be able to be maintained at the rate of 16 million tons a year in 1951-52 as against an actual record level of 16,293,000 tons of steel ingots and castings last year.

Attainment of 16 million tons by 1950 was materially assisted by the large quantities of German scrap which the industry has been able to secure during the past two years.

A marked deterioration of the raw materials position has occurred in the last few months. With the drying-up of German supplies, the industry may be unable to obtain more than 500,000-600,000 tons of imported scrap this year, against 1.9 million tons in 1950.

Imports of iron ore are also likely to prove difficult. Contracts have been placed for 9.3 million tons but shipping problems may make it impossible to bring in more than 8.6 million tons. On the other hand usage of home ore should be substantially increased from 12.777 million to 14.3 million tons if the necessary coke is available.

It is the sudden change in the imported scrap and ore position which makes it necessary to draw on stocks of steel-making materials. But those had been built up very substantially from the 1947-48 level to the beginning of last autumn, so that the industry had a margin in hand. The immediate need is to secure the production of steel at the 16 million ton rate without any further reduction of stocks.

Sulphur Recovery Plants

Three Methods Available

A RANGE of plants specially designed for the recovery of sulphur from gases, has now been announced by Henry Balfour & Co., Ltd., the Scottish gas and chemical engineers.

Gas produced in all the gas works in this country is purified (in accordance with regulations) by methods which remove almost the whole of the sulphur present in crude gas. These measures however do not apply to the gas produced in coke oven installations, although where the coke oven gas is passed into the distribution system of a gas works, it is, of course, purified according to the regulations referring to town gas.

Position Altered

A large proportion of coke oven gas, however, is not utilised in this way, and it would be possible to recover a very substantial amount of sulphur from this gas. Until recently the economics of such a process were not considered to be sufficiently attractive to warrant large capital outlays on suitable recovery plants, but the present scarcity and the rising price of sulphur and sulphuric acid has altered the position substantially.

Other sources of sulphur may be found in blast furnace gas in steel works and also in the flue gases from power stations.

A great deal of work on sulphur recovery plant has been carried out in Germany during the last fifteen years and considerable experience of the problem of sulphur recovery from these gases has been obtained. One of the leading authorities on this particular subject, Dr. Bahr, who was formerly with the I. G. Farbenindustrie, has undertaken the control of the design and operation of these types of plant for Les Fours Lecocq, S.A., of Brussels, and the licence of his processes are now made available to their associates in Great Britain, Henry Balfour & Co., Ltd.

The advantage of this arrangement is that it is not necessary for them to concentrate on a type of sulphur recovery plant which may only be suitable for one given set of working conditions. Instead, they are able to consider and diagnose each particular case according to local conditions and offer a plant specifically designed to suit the immediate case under consideration.

Among the various processes which they are able to apply are three fundamentally different methods, each of which can be varied in many important respects. The first of these processes in principle uses an ammonia wash for the removal of sulphuretted hydrogen, which is recovered as a pure gas and is then converted into elemental sulphur, the ammonia being made into ammonium sulphate in the usual way.

Partial burning of the sulphuretted hydrogen and the re-use of the sulphur dioxide thus formed after combination with ammonia, are involved in the second method to produce a special sulphite wash for the crude gas. The end-product of this process is a liquor which can be converted directly into ammonium sulphate, for fertilising purposes, etc., and also to elemental sulphur.

The third process consists of the washing of the crude gas by means of a special organic solvent which absorbs the sulphuretted hydrogen when cold and which releases it again when heated. The sulphuretted hydrogen can then be converted into elemental sulphur or into sulphuric acid as required.

IN THE EDITOR'S POST

Statement Misleading

SIR,—Referring to the review (Standard Methods of Analysis of Iron, Steel and Ferroalloys, The United Steel Co., Ltd., Sheffield, 1951) on page 537 of your issue of 7 April, 1951, it has been pointed out to me that the statement in the last sentence of the first paragraph, *viz*: 'and recommended by five fully active working subcommittees of the British Iron and Steel Research Association' is not strictly correct and may give rise to confusion.

The position is that as our representatives serve on all the Analytical and Chemical Sub-committees of the British Iron and Steel Research Association, it is natural that the benefits of the various researches should be embodied in our practice at a very early date. For this reason our preface includes an expression of appreciation of the help obtained from our colleagues of the BSIRA Analytical Sub-committees.

GEO. H. DAVISON,
Secretary, Research and Development Department, The United Steel Companies, Ltd.

HOME

Borax and Boric Acid Prices

Owing to further heavy increases in ocean freight and other costs Borax Consolidated, Ltd., have announced an increase in prices as from 2 July as follows: borax, hydrated, all grades and varieties, by £2 10s. per ton; anhydrous borax, by £3 per ton; boric acid, all grades and varieties, by £3 per ton.

U.K. Copper Price Raised

A new peak value for copper was reached on 25 May when the selling price of electrolytic copper was raised by the Ministry of Supply by £24 to £234 a ton. The new price compares with £202 a ton at the beginning of this year and £153 a ton on 1 January, 1950. The Ministry's buying price of rough copper in slabs of from 2-3 cwt. was increased from the same date from £170 to £180 a ton.

Wolfram Price Up

The price of wolfram was advanced in London by 5s. per unit c.i.f. on 25 May. The new rate ranges from 525s to 540s.

Pyrites Mines to be Re-opened ?

The probability that, in view of the world sulphur shortage, some of the abandoned pyrites mines might be re-opened was referred to by Mr. W. P. Rutherford, chairman of the Tharsis Sulphur and Copper Co., Ltd., at its annual general meeting held in Glasgow on 23 May. To develop and equip the mines must be a long-term process measured in years, said Mr. Rutherford, but the plans to erect additional plant to extract sulphur from anhydrite, gave a stimulus to the project.

New Jute Factory Opened

World shortage of new jute goods makes the new factory of William Palfrey (Jute), Ltd., at Newport, Monmouthshire, recently opened, a great asset to the sack-reclaiming capacity of the country. The biggest of its kind in Europe, this factory covers 300,000 sq. ft. and will be concerned both with the re-servicing of used sacks and the manufacture of 'Palfsacks'—multi-ply paper sacks—by the company. It is fitted with the very latest type equipment, say the company, and will provide regular labour for a very large number of people in the area.

Ground Sulphur Price

The Board of Trade have made an Order, coming into effect on 1 June, permitting increases in the maximum prices of all grades of ground sulphur. These increases of approximately 30 per cent result mainly from the rise in freight rates since the start of the year. Copies of the Order, the Ground Sulphur (Prices) Order, 1951 (S.I. 1951, No. 934) can be obtained price 2d. from the sales offices of H.M. Stationery Office.

John Benn Hostels Dinner

The important part the John Benn Boys' Hostels Association plays in giving boys a chance in life and setting them on their feet was stressed in speeches at the May Fair Hotel, London, on Wednesday of last week on the occasion of the Association's annual dinner. The Earl of Derby presided over a large and distinguished gathering. The toast of 'The London Boy' was proposed by Mr. Robert Birley, headmaster of Eton, and Mr. Justice Devlin, submitted the toast of 'The John Benn Boys Hostels Association'. Viscount Leverhulme proposed the toast 'The Guests' and Sir Harold Scott, Commissioner of Police for the Metropolitan Area, replied.

Magnesium to be Controlled

Because of scarcity and because of the importance to defence needs, virgin magnesium, and magnesium alloys are to come under a Ministry of Supply licensing system from 11 June. Stocks held on that date will come within the Ministry control. Licences will only be granted if the Ministry is satisfied that the demand is essential for the re-armament programme. Magnesium scrap is still free of controls.

'Q. and Q.'/Towers Link-Up

Quickfit & Quartz, Ltd., of Stone (Staffs), manufacturers of laboratory, chemical and industrial glassware, have entered into an arrangement with J. W. Towers & Co., Ltd., laboratory furnishers, of Widnes, who will in future act as distributors of laboratory ware for Quickfit & Quartz. This arrangement does not include Quickfit & Quartz chemical or industrial glassware, nor will Messrs. Towers be sole distributing agents.

• OVERSEAS •

Australian Oil Search

The California-Texas Oil Corporation has reached a preliminary agreement with Ampol, an Australian oil firm, to begin drilling test-wells in the north-west of Western Australia. Ampol hold the exploration rights to the area. The initial expenditure on the project will be up to £A1,500,000. The area to be investigated is around Exmouth Gulf, about 800 miles north of Perth.

Aluminium Output

The Government of Venezuela is studying proposals for the installation of a plant to process bauxite and to produce aluminium in Guayana. The Aluminium Company of Canada and the Netherlands Billiton Co. are among the firms interested in the project. The Venezuelan Development Corporation will provide electric power for the plant.

Dutch Anhydrite Deposits

Prospects are being considered of operating some of the large deposits of anhydrite in the Dutch district of Twente. Such a project would help to satisfy Holland's requirements of sulphuric acid and cement. It is expected that some 600,000 tons of anhydrite could be produced annually. Of this amount 30 per cent could be used for producing sulphuric acid (160,000 tons) and cement (also 160,000 tons), while another 30 per cent might be used for producing sulphate of ammonia.

U.S. Magnesium Mill

A continuous rolling mill for magnesium, reported to be the first of its kind in industry, has been installed at one of the Dow Chemical Company's plants in Maddison, Illinois, the company has reported. The action represents the first step in industry from limited to mass production of magnesium sheet, the company said. Production is expected to get under way early in 1952.

New U.S. Storage Battery

A new storage battery that has plates made of nickel powder has been developed in the United States. It is reported to last longer than standard batteries that have lead plates. The new battery can operate at temperatures as low as 40° below zero Fahrenheit.

Stream of Mercury

A gust of mercury surprised workmen digging foundations of a new building in Lisbon, recently, and there was a rush for buckets, teacups and even wine glasses to collect the metal. It is thought to have originated in the cavities of some mercurial ore not previously known to exist in Portugal.

Canada to Ration Some Metals

Rationing of aluminium, brass, and copper by the Canadian Government came into effect on 1 June. Under the compulsory control scheme rationing from mills to manufacturers will be on the basis of 100 per cent of 1950 purchases. These metals had previously been voluntarily rationed by the producing companies.

Atom Bomb Curtains

Strategic Products Incorporated, of Chicago, has produced a metalised window curtain, said to increase the margin of safety in an atomic blast. The Clark Bomb Curtain is reported to offer protection against flying glass, radioactive dust and mist, blinding light from atomic rays, and fire. Metalised with molten aluminium and lead, the curtain fabric is tough, waterproof, and fire-resistant. Cord loops fasten the curtain to steel hooks in a special frame installed in the window casement. When not in use, the curtain rolls up like a window blind. It can be dropped, zippered down, and secured in less than a minute.

U.S. Tinplate Tester

An American steel company has developed an automatic testing device that is expected to save large quantities of tin used for manufacturing tin cans. The new instrument combines Geiger counters and X-ray valves. One valve is placed above the tin-plated sheet being tested and the other below it. The strength of the X-ray beams reflected from the sheet is measured by the Geiger counters and recorded on paper tape. The readings disclose the amount of tin on the test sheet. The machine is the product of two years of research in laboratories of the United States Steel Corporation. In principle it is the same as the β-radiation thickness monitors described at the FBI Conference (*see* CHEMICAL AGE, 12 May, 1951).

Plastics in Industry

Convention to be Held Next Week

TECHNICAL developments of plastics and their potentialities in other industries will be the subject of the British Plastics Convention which is being held in London from 6-16 June in conjunction with the British Exhibition at Olympia.

The convention has been planned to appeal to three main fields of interest: to technologists within the industry, to users of plastics, and to the general public. The inaugural lecture 'The Place of Plastics in Industry,' will be given by Sir Ben Lockspeiser, secretary of the DSIR.

'Plastics in the Chemical Industries' will be the subject of the session on Thursday, 7 June from 2.30-4.0 p.m., with Dr. E. H. T. Hoblyn in the chair. Two papers will be presented. The first will be on 'Applications of Plastics in the Chemical and Applied Industries', by Mr. Verney Evans, special director and chief chemist, Prodorite, Ltd. The second, by Mr. J. D. D. Morgan, Materials of Construction Section, Imperial Chemical Industries, Ltd. (General Chemicals Division), will deal with 'Thermoplastics in Service, with Particular Reference to the Application of Unplasticised Polyvinyl Chloride.'

'True Synthetic Fibres' will be considered at the session from 10.15 a.m.-12.30 p.m. on Monday, 11 June. Mr. H. V. Potter, Plastics and Polymer Group, S.C.I., will preside and Professor E. K. Rideal will speak on 'The Physico-chemical Background of Synthetic Fibres', and Mr. A. Renfrew on 'Terylene'.

Synthetic Resins Session

The morning session on Tuesday, 12 June, will be devoted to 'Developments in Synthetic Resins' with Mr. H. A. Collinson, British Plastics Federation, as chairman, when the following three papers will be delivered: 'Some Investigations into the Fundamentals and Application of Adhesives', by Dr. N. A. de Bruyne; 'Synthetic Resins as Foundry Sand Binders', by P. G. Pentz; and 'Urea and Melamine Resins in Surface Coatings', by F. Schollick.

'Developments in Processing Plant' occupy the morning session of Wednesday, 13 June, with papers by Mr. Joseph Brown on 'Plastics Colendering: Types of Machines and Layouts'; Mr. Edwin G. Fisher on 'Dies and Take-off Systems for Thermoplastic Extrusion'; and by Mr. E. Gaspar on 'Basic Features Influencing the Performance of Injection Moulding Machines'.

'Techniques in Fabrication' will be discussed in three papers at the morning session on Thursday, 14 June, and 'Plastics in Packaging' will be the subject of two papers in the afternoon of Friday, 15 June.

All together 16 sessions will be held covering progress in many important fields.

A collection of summaries of the papers neatly produced in booklet form is available so that anyone interested in taking part in the discussions will be prepared.

Shortage Hits South Africa

SULPHUR shortage is having serious and far-reaching effects on the chemcal industry in South Africa. Many Union industrialists can only obtain 25 per cent of their requirements.

It is claimed that if import permits had been issued three months earlier the position might have been better. Now many industries have had their supplies cut off and are living on stocks. In a few months these are likely to be exhausted, with little chance of replenishment.

Essential chemicals generally are threatening to become scarcer, and a crisis is feared by about July or August. Not even during the war was the shortage so acute, and it is feared that production may be affected enough to cause unemployment.

In addition to sulphur, soda ash is becoming more difficult to get and caustic soda is quite unobtainable. The need to lay in essential chemicals from the small supplies available has even led some larger British firms to explore South Africa as a possible source. Chemical suppliers say cables and letters are pouring in from all over the world.

From England have come big orders for hypersulphide of soda, which cannot be supplied from the Union. Although South Africa produces its own sulphuric acid, it is not enough to keep local industries going. The local cable industry is virtually dependent on sulphuric acid, and if there is a shortage production must fall. Textile manufacturers say they can no longer do essential bleaching processes without hydrosulphite.

The Chemist's Bookshelf

COLORIMETRIC DETERMINATION OF TRACES OF METALS.: (Volume III in the series CHEMICAL ANALYSIS). Interscience Publishers, Inc., New York: Interscience Publishers, Ltd., London. Second Edition, 1950. Pp. xix + 673. Figs. 85. $9.00.

To most analytical chemists the first edition of this admirable book will be so familiar that they will primarily be concerned with the nature of any alterations or additions that have been made, rather than with the total content. The popularity of colorimetric methods of analysis has not declined in the past decade—if anything it has been enhanced; and an expansion so that the present edition shows an increase of about two-fifths over the first edition is only to be expected. The developments in this branch latterly, however, have been in the nature of a consolidation of existing territory rather than an extension of frontiers of knowledge. Indeed, as the author points out, since the appearance of the first edition of the book in 1944, practically no new colorimetric reagents of any importance have come into use.

Briefly, it may be said that the general plan of the first edition has again been followed. The present edition is once more divided into a general part and a special part, and the main chapter headings are quite unchanged. As a consequence of what has already been said about the nature of new work in this field, the chapter in the general part dealing with general colorimetric reagents lists only two additional names, rubeanic acid and toluene-3,4-dithiol. Each chapter of this part has, however, been expanded to some extent by the consideration of new material. One surprising omission is the lack of any reference to recent work on inorganic chromatography and allied methods in the section dealing with separations. The latest reference given for inorganic chromatography dates to 1939, while the latest reference to ion-exchange separations concerns a series of papers in 1947. On the whole, however, the general part appears to have been brought quite adequately up to date.

When one turns to the special part one finds the same method of arrangement for dealing with the colorimetric determination of individual elements, as in the first edition, the normal chapter sub-divisions being:—I, Separations; II, Methods of Determination; III, Special Applications. There is a moderate increase of several pages in the amount of material presented for almost every element. The chapters dealing with the elements beryllium, cobalt, osmium, tungsten and zinc may perhaps be singled out as having undergone major expansion. It is made clear that while the applications of older reagents have been significantly extended in the past six years, it has also been possible, in a few instances, to omit older procedures which further work has shown to be unsound, or which have been superseded. Many new references have been given throughout the work, supplementing the already large number appearing in the first edition.

Professor Sandell, who performed a valuable service in collecting together the vast amount of material presented in the first edition, has placed analytical chemists even more in his debt by thus bringing his book up to date. The general appearance and quality of production of the book are all that one has come to expect of the individuals in this well-known series of monographs.—C.L.W.

Unlimited Supply

An official in Chile has stated that the potassium nitrate to be obtained by the solar evaporation process could conquer world markets as the ideal fertiliser. Under a new process low-grade supplies, hitherto uneconomical to work, and enormous quantities of tailings from the production of past years would now offer an almost unlimited source of supply. Costs were low enough to allow easy competition with synthetic nitrate.

Agricultural Research

New Canadian Laboratory Operating

THE National Research Council of Canada a little more than a year ago established the Prairie Regional Laboratory at Saskatoon, and it is now in full operation engaged in studying at first hand the problems of finding industrial uses for farm wastes, and otherwise bringing the results of scientific research to the aid of the western farmer.

Fermentation of sugars is being studied and the corn smut fungus has been found to be useful in producing antibiotics, fats and sterols. Several antibiotics produced by bacteria are being tested for the control of plant pathogens causing loose smut of barley and wheat. Nearly 1,200 bacterial organisms were investigated last year and it was found that almost half of them gave satisfactory fermentations with glucose for the production of 2,3-butanediol (used as antifreeze), ethanol (ethyl alcohol), acetoin, and lactic acid. Several new analytical procedures were also developed.

Studies on the production of glycerol with Bacillus subtilis (the Ford type) were continued, with the immediate object of finding the best conditions for the rapid fermentation of starch materials to glycerol. A thorough understanding of the nutrition and metabolism of micro-organisms will not only aid in development and control of industrial processes, but the knowledge obtained from these studies may be applied to higher organisms, with consequent benefit to medicine and agriculture.

Crop Utilisation Section

The crop utilisaton section is making a chemical study of the naturally occurring constituents of crop plants, particularly the starchy portions.

Another study is concerned with the industrial use of mould enzymes on wheat proteins with a view to making a soluble product. Separation of wheat gluten from starch and the spray-drying of wheat gluten are being investigated.

Fundamental research is shedding some light on the formation of lignin in wheat plants. It has been found that young wheat seedlings contain only a fraction of one per cent lignin, but that the percentage increases rapidly as the plant heads out. Radio-isotopes from Chalk River are being used as tracers in this study.

An attempt is being made to find out why some cereal straws are weak and others strong.

New results have been obtained on the composition of rapeseed oil which show higher values for eicosenoic and linolenic acids and a lower value for erucic acid than had been previously reported by other workers.

Production of experimental straw board was begun during the year and 400 test boards have been made to date. Tests on these boards show that they compare favourably with standard commercial fibre boards.

Atomic Instruments Course

PHYSICISTS and engineers who wish to obtain specialised knowledge of electronic instruments used in nuclear physics, radio chemistry and work with radio isotopes, are being offered a course at the Atomic Energy Research Establishment, Harwell.

The course will last for one week, starting on Monday, 23 July, and ending on Friday, 27 July, and will deal specifically with the use of electronic equipment for detection and measurement of radiation. On each day the morning will be devoted to lectures and the afternoons to practical work. Design, use and maintenance of counters, D.C. pulse amplifiers, kick sorters, scalers and registers and automatic equipment will be included in the syllabus. Lecturers and demonstrators will be specialists from the Atomic Energy Research Establishment.

Candidates for the course will be expected to have a background knowledge equivalent to degree standard in physics or electronics.

The number that can be accepted on the course is limited to 12, but if there is sufficient; demand, further courses will be arranged. The building used will be the A.E.R.E. Isotope School, which is outside the security fence and the subjects will be entirely unclassified.

The fee for the course is 12 gns. Living accommodation, transport and morning and evening meals will be provided at a charge of 5 gns.

Application for admission to the course should be made as soon as possible to the Electronics Division, A.E.R.E., Harwell, Didcot, Berks.

· PERSONAL ·

It is announced in the current number of the Journal of the Institute of Fuel that the president-elect of the Institute is DR. G. E. FOXWELL, D.Sc., F.Inst.P., F.Inst.F., M.Inst.Gas E., M.I.Chem.E., who will take office in October next. The Institute of Fuel, with a membership of some 3,700, was granted a Royal Charter in August, 1946, at which period the president-elect was charter secretary. For some years he has been a member of the Council, a vice-president, chairman of the membership committee and a member of many other Institute committees. Dr. Foxwell is known particularly for his association with the coke oven and gas industries, and for his work for the Fuel Efficiency Branch of the Ministry of Fuel and Power when he was responsible for much of the technical publications of the Ministry including 'The Efficient Use of Fuel.' He is a past-chairman of the British Chemical Plant Manufacturers' Association.

MR. JAMES RUDDY, director and sales manager, William Fulton & Sons, Ltd., Paisley and Manchester, has been appointed chairman of the Spun Rayon Fabric Dyers' Group in succession to MR. SAM HEAP, chairman of Samuel Heap & Son, Ltd., Rochdale, who has resigned. MR. J. BLAKELEY, Brown & Adam, Ltd., has been appointed vice chairman.

Obituary

The death occurred last week of MR. CHARLES SOWRY, aged 86. He was for many years traveller for the United Indigo & Chemical Co., Ltd., dye manufacturers, Longroyd Bridge, Huddersfield.

The death has occurred of MR. WILLIAM LOWSON at his home, 'The Turnways', Headingley, Leeds, at the age of 76. Until 1945 Mr. Lowson was senior lecturer in the Department of Inorganic Chemistry at Leeds University. Eight years ago he endowed a £2,000 scholarshp in chemistry at the university.

DR. I. E. BALABAN, head of research at Geigy & Co., Ltd., dyestuffs and chemical manufacturers, Trafford Park, Manchester, was killed recently when he fell between a train and the platform at London Road Station, Manchester.

DR. D. F. TWISS, one of the world's greatest authorities on rubber, died at Barton-on-Sea, Hampshire, on 23 May, at the age of 68. Until his retirement in 1946 he was for 32 years chief chemist of the Dunlop organisation during which time he made discoveries which have led to a revolution in the rubber industry. Some 200 patents stand in his name, mostly resulting from research into the properties of rubber, over 100 of them connected with latex alone.

Dr. Twiss carried out a considerable amount of work on vulcanisation with sulphur, using many types of chemical substance to accelerate the process. He discovered the use of zinc isopropyl xanthate (Z.I.X.) as a very rapid accelerator of the vulcanisation process. Another important discovery by him was the use of metallic oxides, specially zinc oxides, in the presence of organic accelerators of vulcanisation which not only enables the combination of rubber and sulphur to take place more rapidly but produces stronger and more elastic rubber.

Dr. Twiss's services were often sought on various important committees, such as the Research Association of British Rubber Manufacturers and the Institution of the Rubber Industry. In 1934 the Institution awarded him its highest honour, the Colwyn Gold Medal, for his scientific contributions to the knowledge of rubber.

Before joining Dunlop in 1914, Dr. Twiss was a lecturer in chemistry at Birmingham Technical School which is now Birmingham Central Technical College.

Among his scientific publications were a volume, of which he was part author, 'A Textbook of Inorganic Chemistry' and 'A Course of Practical Organic Chemistry' of which he was also joint author.

New Du Pont Laboratory

Corrosion and Distillation Research

ONE of the largest research establishments in American industry, the Du Pont Company's new $30,000,000 experimental station at Wilmington, Delaware, was formally opened on 10 May. Specialities of the laboratory will include studies of corrosion in chemical manufacturing, the design of distillation equipment and the behaviour of constructional materials in high-pressure synthesis plants. In the past, due to lack of knowledge about the effects of high pressures on materials, installations were frequently made of heavier and more costly materials than were necessary. One piece of equipment at the Du Pont laboratory is capable of developing up to 200,000 p.s.i., and although this is a low pressure when compared with those required in physics research, it is extremely high for a machine of this type—a hydraulic intensifier—and has already saved the cost of research in a projected expansion of one of Du Pont's high-pressure plants.

A Virile Enemy

In distillation, ignorance often used to be responsible for over-building equipment in the same way. The widespread occurrence of distillation makes economy most desirable and this research should save money in many chemical processes. Corrosion, too, is a virile enemy, especially in the chemical industry, and research on it always repays.

At the opening ceremony, visitors were shown various exhibits illustrating the research work recently carried out by the company. They included:

1. The first public disclosure of a sand-derived material called GS silica, which may some day be used as a thickening agent in grease, with outstanding resistance to heat, water and mechanical breakdown. Although still in the experimental stage, the silica grease has been found to stand up well in laboratory tests simulating the punishment that would be inflicted on wheel bearings in a truck driven in a tight turn at 50 miles an hour for 10,000 miles.

2. Exhibition for the first time of an experimental cloth made from Du Pont's 'Orlon' acrylic fibre, processed so it will not burn at temperatures as high as 1,400°F.

3. An exhibit showing the results of work based on titanium tetrachloride, a key chemical in the manufacture of titanium metal and 'Erifon' flame retardant for textiles.

4. The development with laboratory equipment of pressures as high as 15,000 lb. per sq. in. in basic studies of high-pressure synthesis. In designing high-pressure processes, it is essential to know at what pressure liquids will freeze at room temperatures, since a freeze-up in pipe lines or pumps would have serious consequences.

New Processes for Aromatics

NEWLY developed chemical processes can serve to relieve current shortages of benzene, toluene, xylenes and other strategic aromatic chemicals, three top U.S.A. scientists told a recent meeting of the Chemical Engineers' Club in Washington, D.C.

Dr. Vladimir Haensel, of the Universal Oil Products Co., Illinois, said that the so-called 'platforming' process could be used to produce as many as 700,000,000 gallons of benzene a year. 'The possibility of installing new platforming capacity sufficient to produce 200,000,000 gallons per year is already in sight', he said. The process, he explained, consists of contacting heated oil vapours with a catalyst containing platinum. This in turn creates a change in the molecular structure to produce benzene. The process can be used also to improve the octane count in gasoline. Another speaker, Dr. W. C. Schroeder, chief of the U.S. Bureau of Mines synthetic fuels branch, said that coal hydrogenation was also a source of aromatics. At Louisiana, Mo., he said, a pilot plant has demonstrated that the coal hydrogenation process could be used to produce benzene, toluene, xylene and phenols. He explained that a commercial plant for producing 30,000 barrels of liquid hydrogenated products a day from coal would produce about 34,000,000 gallons of benzene a year; 50,000,000 gallons of toluene, 56,000,000 gallons of xylenes and other aromatics, plus fuel oil, could be produced by the method, he said. The third speaker, Dr. C. L. Levesque, of the Rohm & Hass Co., Philadelphia, told the engineers that the Oxo process, a carbon-monoxide-hydrogen mixture, shows important possibilities for the production of long chain alcohols for use in detergents, plasticisers, and lubricants.

Publications & Announcements

EVERY progressive business gradually needs more space in which to develop its activities, and the increasing demands for scientific apparatus by Government and industrial control and research laboratories and for technical education both at home and abroad has brought this problem to W. & J. George & Becker, Ltd., founded nearly 80 years ago. Progress of the work on its new warehouse and office block at Alperton, Middlesex, is described in the 'Nivoc Supplement' now available.

* * *

TECHNOLOGICAL progress of British industry during the last 100 years was surveyed by Lord McGowan, honorary president I.C.I., Ltd., in an address to the Royal Society of Arts in January this year (THE CHEMICAL AGE, *64*, 139). This was the first of six lectures on 'A Century of British Progress 1851-1951,' organised by the society to celebrate the centenary of the Great Exhibition, of which it was the prime mover. The series of papers is now available in booklet form (3s. 6d.) with an introduction, by Ernest W. Goodale, chairman of the council of the Royal Society of Arts.

* * *

VIBRATION is often a problem when securing different forms of pipe conduits and cables. Two new types of clips to overcome this are described in a leaflet just issued by Howard Clayton-Wright, Ltd., Wellesbourne, Warwickshire. The Claytonrite anti-vibro clips are rubber bonded to metal and are of two types. One, plain (A/9373) assures electrical insulation, while the other conducting or earthing type (A/9381) provides electrical contact through a metal tongue.

* * *

THE DSIR has just reprinted its eleventh leaflet on methods for the detecton of toxic gases in industry, this one being concerned with aniline vapour (HMSO, London, 6d.). Experiments with this vapour have shown that the toxic effects of aniline start in the blood, forming metahaemoglobin which causes cyanosis (blue-grey discoloration at the extremities), and short breath, feeble, rapid pulse, etc., depending on the exposure. Continual exposure may result in anaemia, loss of energy and headaches, and convalescence is slow due to the anaemia. Tests developed for detecting aniline vapour in the atmosphere have shown that the most sensitive one is to add a few drops of dilute bleaching powder solution to dilute hydrochloric acid, through which a known volume of the suspect air has been passed, make alkaline with ammonia, and add a dilute aqueous solution of phenol. The blue colour obtained can be compared with a standard colour made from a dye. Aniline vapour may be expected to occur in the handling or making of dyes, in leather dyeing and polishing, and in rubber, pharmaceutical, and textile dyeing works.

* * *

SHORTAGE and increasing costs of some white pigments have brought to the fore the need for economy in their use, and for more attention to the application of extenders or surface finishes which do not require the use of materials in short supply. Whiting in paint and distemper is the subject of the main article in the quarterly bulletin (No. 7) of the British Whiting Research Laboratories. This number, which also contains notes of scientific and technical meetings, and abstracts from recent literature, is the first to be issued in printed form. It may be obtained by non-members on application, 5s. per copy or annual subscription £1.

* * *

TECHNICAL papers play an important part in the development and spread of knowledge among members of a professional institution or association. Correct preparation and presentation of such papers is discussed in an article by D. H. Bramley and J. N. Fairhead, in the current issue of the *Journal of the Incorporated Plant Engineers* (Vol. II, No. 8).

* * *

BIOLOGICAL stains and reagents are becoming of increasing importance in much laboratory work. A booklet, recently issued, which should be of some practical help is 'Microscopic Staining Techniques' (No. 3), latest addition in this series compiled and edited by Edward Gurr. Stains and reagents by Edward Gurr, Ltd., are being shown in the Dome of Discovery at the South Bank exhibition.

Next Week's Events

MONDAY 4 JUNE

Incorporated Plant Engineers

London: Shell Mex House, Strand, W.C.2, 7 p.m. Talk and Discussion on 'Oil Refineries'.

WEDNESDAY 6 JUNE

The Chemical Council

London: The Royal Institution, Albemarle Street, W.1, 6 p.m. The last in a Festival series on 'Chemistry in the Service of Man'. Professor Sir Cyril Hinshelwood: 'Chemistry and Modern Thought'.

North Western Fuel Luncheon

Manchester: Engineers' Club, Albert Square, 12.45 p.m. Prof. H. Wright Baker: 'What are We Waiting for, You and I?'.

THURSDAY 7 JUNE

The Chemical Society

London: Lecture Theatre, The Royal Institution, Albemarle Street, W.1, 7.30 p.m. Tilden Lecture by Dr. F. L. Rose: 'A Chemotherapeutic Search in Retrospect'.

The Royal Society

London: Burlington House, W.1, 4.30 p.m. The Croonian Lecture by Pro. R. A. Peters: 'Lethal Synthesis'.

Market Reports

LONDON.—A firm trend is noticeable in many sections of the market due partly to the difficult supply position but generally due to rising costs. Pressure for deliveries against contracts is reported and there has been a fair weight of new business. All sections of the market are participating in the strong export demand. Among the soda products there is a good call for sodium hyposulphite, sodium sulphide, and sodium sulphite, all of which have recently advanced in price. Because of the advance in the cost of linseed oil, ground red lead and ground white lead, prices have been increased by £2 per ton. A substantial advance in the naphthalene prices has been the only feature in the coal tar products market and with most items continuing in short supply firm prices prevailed throughout the market.

GLASGOW.—The steady demand for general chemicals has not slackened and all branches of the trade have enjoyed a very busy week, production on the whole being booked for a long way ahead. Now that the distribution of hydrochloric, sulphuric acid and sulphur is working smoothly manufacturers, although not completely satisfied, know where they stand and are able to plan accordingly. Supplies, too, of numerous products have eased and this is assisting the general forward movement of trade.

MANCHESTER.—Chemical traders on the Manchester market during the past week have experienced a steady flow of delivery specifications from consumers of the alkalis and other leading products and there is plenty of fresh inquiry coming on to the market on home-trade account. Buying interest on the part of shippers has also continued in evidence and the movement on overseas account has been on a satisfactory scale. The firm trend of prices is strongly in evidence and fresh advances in sulphate of copper and several other lines have occurred during the past few days. In the by-products section the demand for most lines still tends to outstrip the quantities that are coming forward.

Need to Share Knowledge

EXCHANGE of technical knowledge between the U.S.A. and Great Britain is vital to both countries, declared Dr. P. G. Harvey, of the Billingham Division, Imperial Chemical Industries, Ltd., at the recent meeting in Kansas City of the American Institute of Chemical Engineers

Dr. Harvey, who is visiting the U.S.A. under an ECA educational programme, said that he hoped interchange of chemical engineers could become more permanent. Visits by American experts to England would help to solve some of our common problems. Although we could learn much from America, British research had also yielded information that would be of value to industry in the U.S.A.

Basic research has gone on apace despite shortages, emphasised the doctor, although supply problems sometimes delayed industrial expansion.

The British chemical industry had set an excellent example to other industries in ploughing back a good share of capital into further research. Such a scheme was clearly necessary toward solving the long-term dollar shortage.

Dr. Harvey expects to return to England next month.

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TECHNICAL MANAGER required by the Division of Atomic Energy (Production), Ministry of Supply Factory, Capenhurst, nr. Chester, to be responsible for the investigation of special techniques in the operation of a large chemical engineering plant, the recording and interpretation of operating data and the control of a health physics and general safety organisation. The successful candidate will be required to serve initially at Springfields Factory, Salwick, near Preston, for approximately twelve months.

Candidates must have either an Honours Degree in Chemistry or Physics, associateship of the Royal Institute of Chemistry or the Institute of Physics or equivalent qualifications. They should be familiar with high vacuum techniques, gas flow and refrigeration systems and must have a knowledge of industrial safety regulations and practice.

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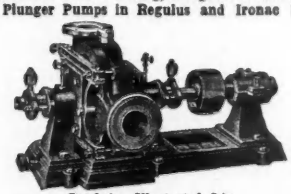

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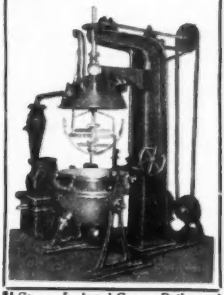

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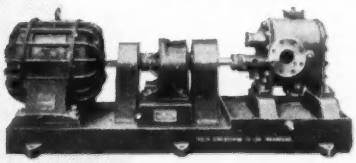

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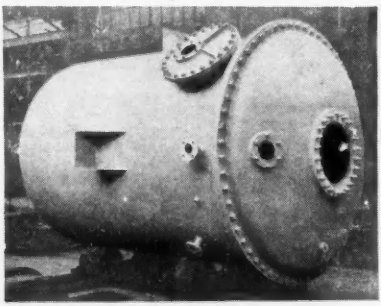

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